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The Treatment of Tetanus with Particular Reference to Chlorpromazine

BY

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Bahamas

AND

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Jamaica

SUMMARY.—Treatment of tetanus is directed on 3 lines:—

1. *Prevention of further absorption of toxin by injecting antitoxin, giving appropriate attention to the wound, and administering antibiotics.*
2. *Production of muscle relaxation and control of spasms by various drugs of which the most useful are the curare-like compounds and chlorpromazine.*
3. *Supportive measures include all the details of good nursing. Semi-solid or liquid foods, glucose saline, and protein hydrolysates are useful.*

The main methods of treatment in recent years are summarised and data is given relating to 41 cases occurring in the Caribbean of which 19 recovered and 22 died. Ten selected cases, all of which received chlorpromazine, are described in more detail. Five of these cases—2 dogs, a donkey, a bull, and a pig—recovered.

THIS article reviews the main literature of veterinary interest which has been published in recent years and includes some personal observations and case reports.

Gruner (1956), with his experience of treating 58 horses, considers that the prognosis depends upon the incubation period, the duration of illness, and the condition of the horse. The chances are low in the first year of life. After the eighth day of the disease the prognosis is more favourable. After 14 to 24 days the animal is cured, but may not be used for work before the fourth to fifth week.

The percentage recovery from the disease is difficult to assess. Of 136 horses described by Gratzl (1955) as being treated with antitetanus serum, phenol, and chloral hydrate, 21 per cent. recovered.

Fontaine and Jondet (1955) state that tetanus in the dog is not always fatal. Hogarth (1950) writes that tetanus in the dog is quite common in West Australia, the mortality rate is low and the prognosis is good. There is no doubt that tetanus in most cases is a severe disease with a high mortality rate. The disappointing results of treatment in animals are often due to the owner seeking professional advice when muscle spasms are widespread and when the animal is in a dehydrated and exhausted state with death imminent. Yet it must be admitted that even cases that are seen in the early stages can rapidly develop severe spasm which in the past has defeated various methods of treatment. Recent authors have described how treatment has unquestionably benefited the animal and either saved life or hastened recovery.

Methods of Treatment

Treatment, which should begin as soon as possible after signs of the disease appear, is best directed along 3 lines:—

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1. Prevention of further absorption of toxin.
2. Production of muscle relaxation and control of spasms.
3. The maintenance of strength, the treatment of dehydration, the prevention of pneumonia, and other supportive measures.

1. *Prevention of Further Absorption of Toxin*

To neutralise toxin still circulating in the blood, antitoxin can be given intravenously in large doses, but many authors believe that antitoxin treatment alone does not give much hope for success. Johnston (1958), after studying a series of 100 human cases at Ibadan, concluded that antitoxin is of little value. We believe, however, that an effort to neutralise the toxin, combined with other treatment, is rational and justified.

Penezic (1953) thinks that simultaneous treatment with serum and toxoid may have some advantage over serum alone but Gruner (1956) states that treatment with serum and toxoid simultaneously has no advantage over serum treatment alone. On theoretical grounds we agree as we think that the toxin itself will stimulate maximum antitoxin production.

The value of antitoxin intrathecally is still disputed. One of us (B. L. N.) used this method in an advanced case in a donkey and some improvement occurred. Stern (1944) claims recoveries in severe cases in horses using this method. Stumf (1952) describes a mechanical method of increasing the permeability of the blood-brain barrier, thereby making possible the penetration into the cerebrospinal fluid of tetanus antitoxin administered intravenously. Eaton (1951) describes hexamine as an agent for breaking down the blood-brain barrier. This has been used in certain of our cases, but it is impossible to assess its value in practice, and, as far as we are aware, there is no real proof that hexamine has any pharmacological action on the blood-brain barrier.

Treatment with penicillin to destroy *Cl. tetani* and prevent further production of toxin is now routine practice. The British Encyclopaedia of Medical Practice (1952) states, however, that there is no evidence that penicillin or any other antibiotics have any effect on established, uncomplicated tetanus, but they are of value in treating intercurrent infection, of which the commonest and the most dangerous is pneumonia. Penicillin should therefore be given as a routine. Antibiotics help to control wound infection, and in doing this have an indirect effect upon the severity of the tetanus infection and the production of toxin in the wound.

Local treatment of the wound is usually carried out with antibiotics, or with hydrogen peroxide, potassium permanganate, or other antiseptics. Where the uterus or navel is the source of infection, it should be treated accordingly.

2. *Production of Muscle Relaxation and Control of Reflex Spasms*

The anaesthetic and narcotic relaxants such as chloral hydrate, ether, bromides, paraldehyde, bromethol, and barbiturates have been used, successfully in some cases, both in human and animal tetanus. Magnesium sulphate, administered by subcutaneous or intramuscular injection, has been used in treatment for many years. More recently it has been employed intravenously by Seneviratne and Pillai (1953) in canine tetanus.

The muscle relaxants acting on the motor end plate have value in therapy. Curare (Woorara) was used by Sewell in the treatment of tetanus as early as 1835 (Smithcors, 1956), but it is only in more recent years that the curare-like compounds have been used in a scientific manner to control the spasms and produce muscle relaxation in the disease. Of great veterinary interest is the report by Booth and Pierson (1956) on the successful treatment of a 1,000-lb. mare with aqueous and oil preparations of d-tubocurarine chloride. A generalised relaxation of muscles and control of tetanic spasms allowed limited eating and drinking. Synthetic relaxants have been used in horses and dogs by Gratzl (1955), but inconclusive results were obtained. Mephanesin and mephanesin carbamate, acting by depressing the reflex activity in the spinal cord, have only a short duration of action and this limits their value. Muscle relaxation has been obtained by European workers using "Epiphysan"—a preparation of cattle pineal gland—and successful recoveries are reported in horses by Hutschrenheiter (1952) and Shneeweiss (1956).

Chlorpromazine is a phenothiazine derivative with complex pharmacological actions but producing sedation and muscular relaxation. It is currently widely employed in human medical practice as a means of controlling tetanic spasms. Its use in tetanus in horses has been reported by various authors. Van den Heever (1956) injected 500 mg. intramuscularly followed by 250 mg. twice daily in a 1,200-lb. horse for 10 days, with a successful outcome. Tait and Ryan (1957) used 500 to 700 mg. intramuscularly daily in divided doses in a 1,000-lb. horse for 11 days. A crisis occurred on the sixth day but was controlled by increasing the dose. They also successfully treated a foal using 100 to 150 mg. daily. Owen (1955) used larger doses both intravenously and intramuscularly with beneficial effects, but treatment was only continued for 27 hours. Troughton, Gould, and Anderson (1955) state that in 4 horses the administration of chlorpromazine in daily doses of 2 mg. per kg. intramuscularly had a sedative effect and produced some degree of muscular relaxation. The most recent report is that of Lundvall (1958) who injected intravenously about 250 mg. twice daily into 1,050 lb. American Saddlebred gelding. The horse seemed a little worse on the fourth day and then gradually improved. Treatment was continued for 10 days and the animal was sufficiently improved to leave the hospital on the fifteenth day. Two Shetland ponies, which, when first seen, were almost comatose, were also injected with chlorpromazine intravenously. Although muscle relaxation occurred, both died within 48 hours.

In the cases recorded, the drug was found to have a profound effect on the disease in that muscular relaxation was satisfactory. There was consequent improvement in respiration and the reduction of trismus allowed the animal to eat and drink nor-

mally. Hyperaesthesia was reduced or abolished. In contrast to the anaesthetics and narcotics, of which heavy doses would be required to produce this degree of muscle relaxation, consciousness was maintained and the animals remained standing. The 5 per cent. solution employed was irritant to the musculature but the swelling subsided, and no permanent effect was noted.

Fontaine and Jondet (1955) used chlorpromazine combined with pethidine, promethazine, and other drugs in 2 cases of relatively severe tetanus in dogs. A state of sedation was obtained, but the dogs were able to eat and drink and urinate normally. Recovery occurred in 6 and 8 days respectively.

With many new synthetic central nervous system depressants now being produced, we can expect soon to learn of their use in cases of tetanus. Promazine, in a dose of 350 mg. intramuscularly, has already been employed in a Shetland mare (Shambaugh, 1958). Meprobamate, phenaglycodol, and promoxolane would seem to be worthy of trial as they are all skeletal muscle relaxants acting centrally and having sedative action. Acetyl-promazine is being used.

3. *Supportive Measures*

One of the most important features of treatment is good nursing. An animal in hospital conditions with constant skilled attention has greatly increased chances of survival. On the other hand, the excitement of transporting an animal can overstimulate it to a fatal degree and we advise an injection of chlorpromazine prior to movement. In some cases transportation is a physical impossibility due to the terrain.

Wherever possible an animal suffering from tetanus should be placed in a darkened room and, as loud noises and sudden movement may precipitate a tetanic spasm, they should be avoided. Slinging of horses appears to be a valuable adjunct to therapy even in mild cases; the rest that the animal can take is of great benefit to it.

As many cases cannot lower their heads, it is important to raise their food to a certain height. Where herbivora are able to swallow, a mixture of molasses and water with a little cornmeal added is nutritious and laxative. In treated cases the masticatory muscles appear to recover before the superficial musculature which moves the lips. Hence, when the animal can chew and yet its lips cannot pick up food, it is important to feed it by hand. At this stage, nursing is of paramount importance, and if the animal is allowed to become hungry and frustrated it soon seems to give up trying to survive.

It is essential, particularly in a tropical or subtropical climate, to prevent or alleviate dehydration by the administration of fluids. Horses will sometimes swallow if a slowly-flowing hosepipe is held in the mouth. In severe cases saline or glucose saline should be injected intravenously. In pigs, where some difficulty may be experienced in infusing large volumes intravenously, intraperitoneal injections or subcutaneous injections combined with hyaluronidase can be given. In the case of ruminants water can be administered *via* a trochar or ruminal fistula.

Pneumonia is not so commonly seen in animals as in human cases.

Case Reports

Table I records the treatment, deaths, and recoveries in 41 cases of tetanus. Nineteen cases lived and 22 died, but no statistical conclusions can be drawn from such a record. Many of the cases reported as "died" were shot for various reasons. The prognosis of some was considered hopeless, but in others transportation or economic reasons were the ruling factors. Details of 10 of the more interesting and instructive cases, all of which received chlorpromazine, are given here.

Case 1.—Donkey

A 5-year-old male donkey was walked 3 miles to the hospital, the journey taking 4 hours. The gait was extremely stiff but the animal was able to eat and drink very slowly if food was brought up to the mouth. Tail stiffness had been noticed 3 days earlier and ear and limb stiffness the previous day.

A total of 80,000 I.U. antitoxin was given in divided doses in 4 days, and 3 mega units of penicillin on the first, third, and fifth days. Four grammes of hexamine in aqueous solution were given intravenously on the first 4 days. Chlorpromazine in a dose of 250 mg. intramuscularly was given on the first and fourth days, while on the second and third days the same dose was given twice daily.

TABLE I

RECORD OF TREATMENT, DEATHS AND RECOVERIES IN 41 CASES OF TETANUS

Animal	No treatment		Treatment without chlorpromazine		Treatment with chlorpromazine		Total
	Lived	Died	Lived	Died	Lived	Died	
Horse	1	1	3	–	2	3	10
Mule	–	–	1	–	–	–	1
Donkey	–	4	1	1	1	2	9
Cattle	–	2	1	1	1	2	7
Goat	–	–	–	1	–	1	2
Pig	2	2	2	–	1	2	9
Dog	–	–	–	–	3	–	3
					Total cases		41

One hour after the first injection of chlorpromazine the animal became relaxed and was able to feed easily from the ground. From then on there was gradual but satisfactory improvement. Defaecation occurred on the second day and at intervals throughout the illness. By the seventh day the animal remained relaxed except when stimulated —when slight tail stiffness and tensing of the muscles occurred. Final recovery was uneventful.

Case 2.—Horse

A 14-year-old stallion hack weighing about 400 kg. was first seen when able to walk but unable to drink. There was hyperaesthesia and laboured respirations of 70 per minute.

Chlorpromazine (250 mg.) was injected intravenously and 6 mega units of penicillin intramuscularly. Within 5 minutes there was some muscular relaxation, particularly of the limbs and tail, and after an hour there was knuckling of the limbs and prolapse of the penis. Head and neck muscles were still rigid and the horse was still unable to swallow. Respirations were now 50 per minute and hyperaesthesia was less. During the next 24 hours 1,000 mg. chlorpromazine intravenously and 500 mg. intramuscularly were administered, and some water was swallowed from a flowing hosepipe held in the mouth. Urination occurred nostrils, and the head and neck muscles were rigid. 660 mg. of sodium pentobarbitone were given by slow intravenous injection. Some relaxation occurred, with improvement in respirations, but 30 minutes later the horse went

down. Further small doses of chlorpromazine were given during the next 20 hours, but great deterioration occurred and the animal was destroyed.

Case 3.—Bull

A 15-month-old bull calf had a history of bloat for 24 hours. It was unable to rise, eat, or swallow. There was a generalised muscle rigidity and marked trismus. When in lateral recumbency mild spasms of the limbs were apparent.

The rumen was trocharised and the trochar sutured in place. Two litres of a mixture of molasses, cornmeal, and water were poured through the trochar daily after ascertaining that it was still in the rumen. Daily treatment for 4 days consisted of 4,000 I.U. antitoxin intravenously, 2.7 grammes hexamine in aqueous solution intravenously, 1 mega unit penicillin and 250 mg. chlorpromazine.

The calf made a gradual but progressive recovery, commencing to suck liquids from a raised bucket on the second day and to feed itself on the fourth day. On the fifth day it appeared to be normal and no further treatment was given.

Case 4.—Cow

A 5-year-old 300 kg. cross-bred cow had shown typical signs of tetanus for 3 days. The disease was probably acquired at parturition 3 weeks previously. She was injected intravenously with 250 mg. chlorpromazine and intramuscularly with a further 250 mg.

Within 5 minutes the tail had dropped, there was more motility in the jaw, belching occurred, and the respiratory rate fell. During the next hour muscle rigidity became less but marked tympany remained. Attempts to drink were unsuccessful. Six mega units of penicillin were injected into the uterus and 3 litres of glucose saline administered intravenously.

Owing to out-island transportation problems, the cow was not seen again for 24 hours, by which time all muscles were very rigid and there was severe dehydration. The total amount of chlorpromazine available was 250 mg. and this was injected intravenously with similar effects to those already described. A fistula was made in the rumen under local anaesthesia and the reduction in the size of the tympanitic rumen greatly relieved the embarrassed respirations. Five gallons of water containing 1 ounce of chloral hydrate were pumped into the rumen. The improvement which occurred proved to be only temporary as the cow died during the night.

Case 5.—Cow

A 3-year-old Guernsey cow treated by intravenous and intramuscular injections died during the night of the thirteenth day of treatment. The reaction to intravenous doses of chlorpromazine is of interest in this case. Widespread trembling, rapid blinking of the eyelids, and an increase in the respiratory rate occurred shortly after the injection of 250 mg. chlorpromazine in 5 per cent. solution. Pupil size showed no change. This was followed on about half the occasions by limb and neck spasticity, the animal falling on its side but regaining its normal posture in 1 to 2 minutes. The ensuing muscle relaxation, control of spasms, and eructation of rumen gases was satisfactory.

Case 6.—Pig

A native pig weighing about 40 kg. had been castrated 8 days previously and signs of tetanus had been noticed for 2 days by the owner. The pig's gait was characteristically stiff, the ears were drawn back, and the tail slightly raised. It was unable to get its head down to feed properly but could suck and swallow food held up to its mouth. 30,000 I.U. antitoxin subcutaneously, 1.2 mega units procaine penicillin intramuscularly, and 150 mg. chlorpromazine subcutaneously were given. When seen 18 hours later, it appeared as if the animal was still affected by the chlorpromazine; it was lying down quietly having eaten its morning meal and was able to rise and move without difficulty. During the night urination and defaecation occurred. A further 100 mg. chlorpromazine subcutaneously and 1 mega unit penicillin were administered.

Next morning the pig appeared normal. No further treatment was given and the animal made a complete recovery.

Case 7.—Pig

A native boar weighing about 25 kg. showed advanced clinical signs of tetanus but no external wound could be found. 100 mg. chlorpromazine in 5 per cent. solution injected intramuscularly produced no visible change in 2 hours. A further 150 mg. was injected intramuscularly, and 5 hours later an additional 250 mg. A litre of normal saline was injected intraperitoneally. These high doses produced little clinical improvement, and the pig died during the night.

Case 8.—Goat

A 3-year-old female goat weighing 20 kg. was treated with 150 mg. chlorpromazine both intravenously and intramuscularly in divided doses for 5 days. Smaller doses given at the commencement of treatment had little effect. 100 mg. daily was then given for 2 days, followed by 50 mg. on the eighth day. Supportive therapy included 15,000 units of tetanus antitoxin and was in other respects similar to the dog described in Case 9.

After treatment belching was commonly observed and trocharisation of the rumen due to tympany had only to be performed on 2 occasions. Some muscular relaxation was produced, but marked stiffness still persisted in the neck and hind limb muscles. With the goat in the sternal position, the head had to be tied with a rope halter to a ring in the floor to prevent the extreme dorsal contracture which otherwise occurred. However, spasms were controlled, and respiration, urination, and defaecation were satisfactory. Drooling of saliva occurred and a keratitis of the right eye developed due to lack of blinking, though the reflex was still present.

Swallowing was possible except on the fourth to the sixth day. On the fourth day the temperature rose to 105.5°, with respirations shallow. A severe oedema of the abdominal wall and the limbs developed on the sixth day. On the eighth day the goat was able to stand with support and only some stiffness in the hind limbs remained. She swallowed one and a half litres of milk mixed with 250 g. of glucose.

While moving the position of the goat prior to feeding on the ninth day she died suddenly from heart failure. *Post-mortem* examination showed oedema of the abdominal wall and limbs only.

Case 9.—Dog

Six days after an operation for spaying, a 6-month-old mongrel bitch weighing 13 kg. was seen with classical signs of tetanus. She was able to walk with difficulty but unable to rise or to swallow. A dose of 50 mg. chlorpromazine intravenously produced some muscular relaxation and improvement in respirations. The hard pulse became softer. She was just able to swallow. Daily doses of 300 to 400 mg. were required to control spasms on the third and fourth days, and even with these massive doses complete relaxation was not obtained. Dysphagia became complete until the eighth day when 50 ml. of milk was taken orally. Smaller doses of chlorpromazine were continued until the eleventh day.

The bitch was able to urinate throughout the illness, but defaecation did not occur until the eleventh day. Oedema of the legs developed on the fifth day and remained a week. The sixth day was probably the period of crisis. Lapping recommenced on the eleventh day, and walking was possible on the sixteenth day. After 3 weeks the bitch was relatively normal, apart from some muscular atrophy and resolving abcesses on the shoulder and hind limb.

Supportive therapy included tetanus antitoxin (40,000 I.U.), penicillin, streptomycin, and tetracycline. Normal saline, glucose saline, Hartmann's Solution B.P. (Ringer-Lactate), and fibrin hydrolysate (Aminosol: Abbott) were given subcutaneously mixed with hyaluronidase. Frequent turning was carried out to prevent lung congestion. Urine scalding was treated with a proprietary baby powder.

Case 10.—Dog

A cross-bred Boxer weighing 30 kg. sustained a laceration of the flank with subsequent suture breakdown and wound infection. Eleven days after the initial injury the animal was presented showing typical signs of tetanus. At this

stage the animal was walking with difficulty but was unable to rise if put on its side. Breathing was rapid but easy, and liquid food could be taken if presented to the animal on a raised level and not on the floor, due to spasm of the neck muscles. Chlorpromazine, 100 mg. intramuscularly, was given at 12-hourly intervals for 6 days, and during the first 2 days of treatment daily doses of tetanus antitoxin (10,500 I.U. intravenously) were given. The onset of muscular relaxation was noticeable some 20 to 30 minutes after administration of the chlorpromazine, and was shown by the animal's ability to take food from a lower level and accomplish a limited yawn. At no stage in the treatment of this case was complete dysphagia present, although on the third and fourth days of treatment the animal was only able to suck small amounts of liquid food into its mouth and swallowed with great difficulty. A muco-purulent rhinitis developed at this stage due to inhalation of food into the nasal cavity while attempting to eat.

The dog experienced no difficulty in urinating or defaecating. The temperature was 103.5° to 104° F. for the first four days. Oedema developed in the hind quarters due to the deep intramuscular injections of chlorpromazine. 5 per cent. solution was used in this case.

Additional treatment included penicillin, glucose saline, and large doses of vitamin B_{12}. At the end of 2 weeks the dog was relatively normal.

Discussion

Because of the varying severity of tetanus, and the lack of identical controls, it will be necessary to record a large number of cases before any strong claim can be made to any one drug reducing the mortality rate as compared with other methods of treatment. Spontaneous recovery without treatment may occasionally occur. One of us (B. L. N.) has seen such recoveries in a foal and two pigs. At the other extreme are those cases which die despite the best possible treatment and constant attention. The accessibility of the patient and the amount of attention it receives have also been very variable factors in many of our cases and have influenced the outcome.

Treatment with antitoxin and penicillin we believe to be rational, and, while d-tubu-curarine has much to recommend it if hospital conditions are available, one of the more satisfactory treatments at the present time is the administration of chlorpromazine. This drug relieves spasms, reduces exhaustion, and probably lessens the mental anxiety of the afflicted animal. Recovered human patients treated with chlorpromazine have little or no recollection of their otherwise painful and distressing condition. In many animals, but not all, the ability to eat and drink is restored. The drug is unlikely to be of value in comatose and severely exhausted cases. Lundvall (1958) records early death in 2 such cases in ponies, and this has been our experience in 2 horses and a donkey.

Recoveries in 8 of our cases out of 18 treated with chlorpromazine can be considered very encouraging. The tetanus was reduced but not controlled satisfactorily in the cow (Case 4) and the horse (Case 2) at the doses employed. It is of interest that after a dose of more than 1.5 mg. per kg. in the cow she was still unable to drink, whereas the horse described by Lundvall (1958) as being unable to drink for 24 hours, drank several gallons of water after an injection of 0.3 mg. per kg. (We later injected chlorpromazine from the same batch into healthy animals and found it to be of normal strength.) This difference in the severity of the disease and the effect of the chlorpromazine is well exemplified by the 2 dogs both of which recovered, although Case 9 was severely ill. Our case in the horse is unfortunately complicated by the pentobarbitone which was given.

The poor effect produced in the pig (Case 7) is considered due to lack of absorption of the drug. Ritchie (1957) records injecting 3 healthy boars intramuscularly and obtaining no sedative effect. It may be better to use the intravenous route in this species.

Death from heart failure in the goat on the ninth day, at a time when the tetanus was almost abolished, was probably due to moving the animal while in a hypotensive state. The oedema developing in this case and in one of the dogs (Case 9) is believed to be due to hypotension, but an additional factor to consider is the electrolyte balance. When large volumes of liquid are administered parentally it is advisable (but not always possible) to control the electrolyte balance. Even the taking of haematocrit values would be a useful guide. In those cases not responding satisfactorily to more moderate doses of chlorpromazine, we intend to try a mixture of chlorpromazine with another drug such as pethidine or chloral hydrate, with the object of producing controlled relaxation without the severe hypotension which occurs when large doses of chlorpromazine are given. Richter (1957), working in fairly primitive conditions and with no hospital facilities, had recoveries in 2 human adult cases of tetanus following treatment with chlorpromazine and chloral hydrate. Using the same treatment in 3 cases of tetanus neonatorum (umbilical infection), he had one recovery. In Tanganyika, where hospital facilities are not ideal and where constant observation of patients is not possible, Cole and Robertson (1955) found chlorpromazine, combined with phenobarbitone sodium in adults and chloral hydrate in children, a practical treatment. Tetanic spasms were controlled for 8 to 12 hours.

Whatever main method of treatment is adopted, we would stress that good nursing is essential for a successful outcome. We attach a certain importance to the psychological aspect of keeping up the animal's will to live—which depends in large measure on who is caring for the animal. This applies particularly to horses and dogs.

Acknowledgments.—The authors are indebted to the staff of the Library of the Royal College of Veterinary Surgeons and the staff of the Cohen Library, Liverpool University, for kindly obtaining references and supplying copies of certain articles.

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The Radiographic Outline of the Genital System of the Bitch*

BY

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SUMMARY.—1. *A technique for outlining radiographically the female canine genital system is described.*

2. *The normal radiographic appearance of the female canine genital system is illustrated.*

3. *The uterine outlines in certain pathologic conditions are illustrated.*

THE diagnosis of pathologic changes of the canine uterus and oviducts and an assessment of the extent of such changes are difficult problems. Up to the present time the most useful diagnostic aids have been the total and differential white cell counts and the plain radiograph (Engle, 1940; Schnelle, 1950); the latter being of use only when the uterus is grossly distended.

In 1954, Glenney showed how the introduction of air into the peritoneal cavity can be of use in the radiographic diagnosis of advanced pyometra, and in 1956 Shapira outlined the vagina of a bitch during trials on the suitability of caesium chloride as a contrast medium.

For many years the injection of radiopaque materials into the uterus (hysterography) and uterus and oviduct (hysterosalpingography) has been widely practised in human radiography. In 1956, Collery attempted to introduce radiopaque material into the canine uterus making use of the instruments used in man, and suggested that special instruments would have to be designed. The most obvious difficulty involved in producing adequate hysterosalpingograms in the dog arises from the narrowness of the cervical canal and of the vagina allowing only limited space for the manipulation of instruments. This difficulty is, however, more apparent than real, and it has been possible to develop a safe and simple technique for hysterosalpingography in the bitch requiring a minimum of instruments.

Materials and Methods

The 7-inch metal urethral catheter normally used for catheterising the bladder of bitches is the ideal shape for introduction through the cervix into the uterus, the 45° angle of the tip corresponding very closely to the normal upward tilt of the canine cervi-

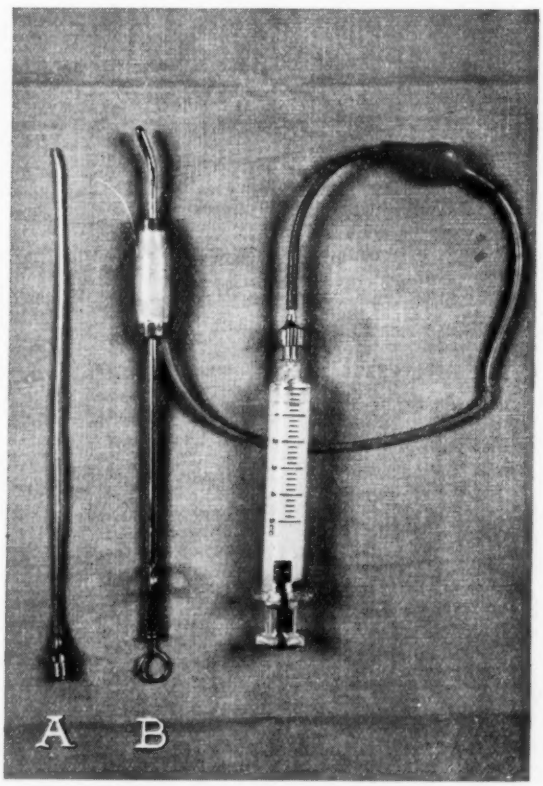

FIG 1.—Apparatus for hysterosalpingography. The apparatus for the introduction of dye into the uterus consisted of a tom-cat catheter (A) which is inserted into the 7 in. metal catheter (B). The inflatable cuff from an endotracheal tube complet[illegible] apparatus.

* Abstracted from a thesis accepted by the Graduate Studies Committee of the University of Toronto in partial fulfilment of the requirements for the degree of Master of Veterinary Science.

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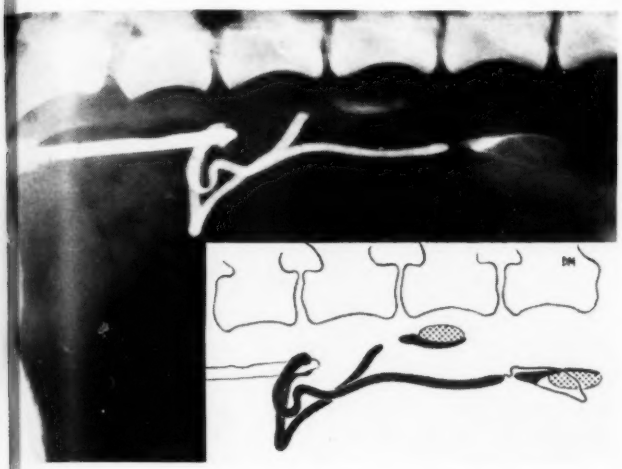

FIG. 2.—Hysterosalpingogram of a normal 6-month-old bitch. Both uterine horns, the right oviduct and both ovarian bursae are outlined. The cervix and uterine body are displaced forward by the catheter.

FIG 3.—Hysterosalpingogram taken during "heat." Both horns and one oviduct are outlined. While the uterus is greatly enlarged at oestrus the normal coiling is exaggerated in this radiograph, because the exposure was made with the abdominal muscles tensed.

FIG. 4.—Hysterogram taken at oestrus. Both horns and the cranial half of the uterine body are outlined. Note the terminal dilation of the uterine horns. This is found in approximately 50 per cent. of hysterograms.

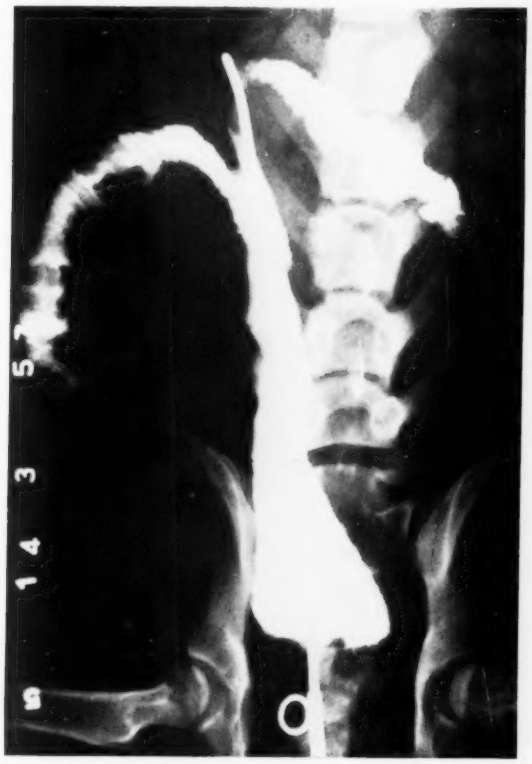

FIG. 5.—Hysterogram taken at 3 days *post partum*. Six denuded regions are seen from which maternal placenta was removed together with the foetal placenta at parturition. The tip of the catheter is seen pressing against the wall of one horn of the uterus.

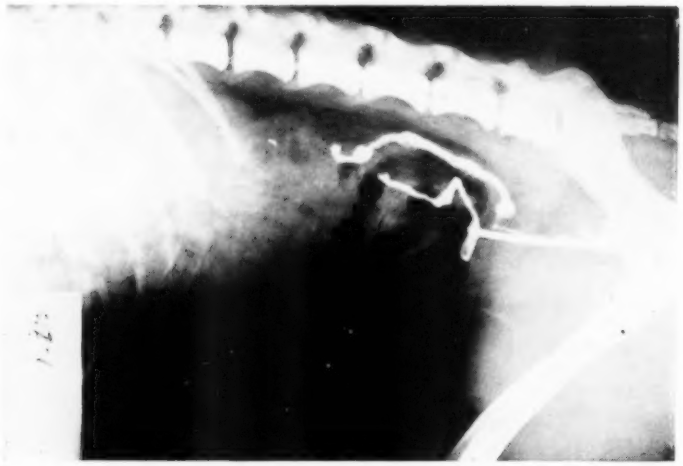

FIG. 6.—Hysterogram 2 months *post partum*. The 6 dilations in the uterine outline indicate the areas of previous maternal placentation. The impression of the uterine ostium of the left oviduct is clearly seen.

FIG. 7.—Hysterogram of subacute metritis—3 weeks *post partum*. The normally clear cut areas of placentation are disrupted by metritis and only the terminal section of the dependent horn appears normal.

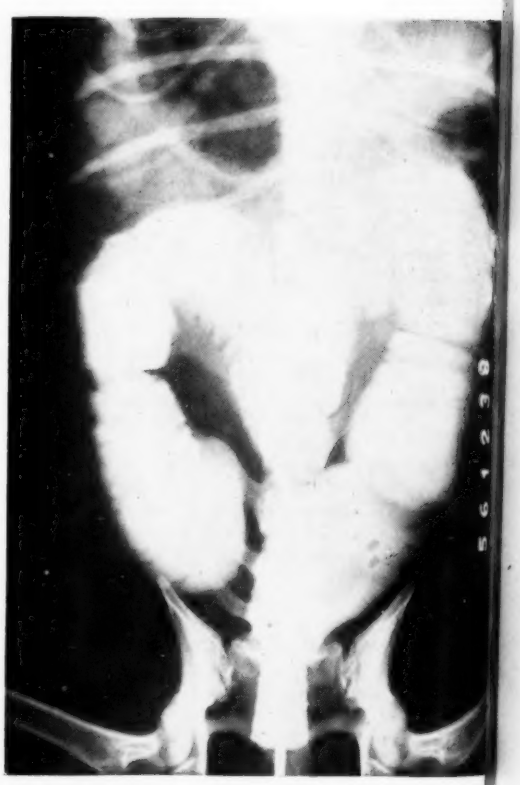

FIG. 8.—Hysterogram of a case of hyperplastic endometri
Both horns were grossly dilated with fluid. Thirty c
centimetres of 20 per cent. aqueous Skiodan sodium
injected into the uterine body and became dispersed through
the fluid contents of both horns. Subsequently the uterus
drained through the catheter and ovariohysterectomy perform

cal canal. It is essential that the tip of the catheter be well rounded, otherwise there is a possibility of accidental passage of the catheter through the cranial vaginal wall into the peritoneal cavity. An inflatable cuff cut from a Magill endotracheal tube is fitted around the catheter in such a way that, when the tip of the catheter is in the body of the uterus, the cuff inflates just caudad to the external cervical os. This prevents seepage of dye back down the vagina and also allows an outline of the external cervical os to be made. A metal tom-cat catheter is shaped to fit closely inside the bitch catheter (see Fig. 1). Both are filled with dye, and when the outer catheter is in position, the inner catheter, which is attached to the loaded syringe, is inserted; in this way the accidental injection of air is precluded.

In 1953 Roland listed the requirements for the ideal dye for hysterosalpingography in man. They have been found to apply equally well to the dog.

1. The ideal radiopaque dye must be totally innocuous to the organism as well as to the reproductive organs.

2. It must possess that degree of resorbability which would enable it to disappear from the system rapidly and completely after it has accomplished its diagnostic purpose, leaving no residue.

3. It must have the proper viscosity that will adequately permit of radiographic demonstration of adherent and partially strictured tubes.

Such a dye would have to be water-soluble. Dyes with an oil base were, until recently, widely used, but numerous reports (Davids, 1953; Goldberger, 1950) describing peritoneal and tubal adhesions after hysterosalpingography militate against their use. The water-soluble dye Skiodan sodium* adequately fills all three requirements.

Skiodan sodium is an organic compound containing 52 per cent. of iodine in firm combination. It is not decomposed in the body, and no free iodine or inorganic compound is found in the blood stream after its use. It is manufactured in both 20 per cent. and 40 per cent. strengths, which are made in viscous (acacia) or aqueous solutions. Skiodan sodium 40 per cent. (acacia) is found most suitable for outlining the normal genital system, or when it is suspected that there is little or no distension of the uterus. The dosage rate is approximately one cubic centimetre per 10 lb. bodyweight, but requirements may vary up to 25 per cent. either way. Where gross distension of the uterus is suspected, Skiodan sodium 20 per cent. (aqueous) is used. Absorption of Skiodan sodium from the uterus begins immediately on its injection and is almost complete in 30 minutes in the normal uterus, at which time the dye is often seen in the kidney pelves, the ureters, and the bladder.

In order to ascertain if the dye was innocuous to the genital tissues, ovariohysterectomy was performed on 3 normal dogs on the first, second, third, fourth, and fifth day following hysterosalpingography. A gross and microscopical study revealed a complete absence of tissue reaction in all 15 animals. This also indicated the safety of the technique from the point of view of the possible introduction of infection from the vagina into the uterus and, where spillage occurs, from the uterus into the peritoneal cavity.

The preparation of the animal is commenced, whenever possible, on the day before radiography. Food is withheld for 12 hours prior to radiography and castor oil (one cubic centimetre per 10 lb. bodyweight) administered. The use of cathartics is preferred to that of an enema, because the accidental introduction of air during the administration of an enema might confuse the interpretation of the radiograph. In those cases in which an animal is presented for immediate attention, or in which there is no evidence of defaecation after castor oil, the descending colon is gently washed out half an hour prior to anaesthesia.

The anaesthetic used depends upon the general condition of the animal; pentobarbitone sodium* is used on normal healthy dogs, but mepazine†, thiamylal sodium‡ or a mepazine-thiamylal sodium combination has proved safer in the debilitated animal. Anaesthesia is produced to such a plane that pressure on the cervix does not invoke any response from the animal. Usually at this plane of anaesthesia pressure between the toes of the hind leg invokes a very slight withdrawal reflex.

With the animal anaesthetised and lying on its right side the catheter is passed into the vagina until the tip is pressing against the cranial vaginal wall. The catheter is held firmly in this position and the cervix fixed between the index finger and thumb of the left hand in such a way that the ventral abdominal wall is in contact with the palm of the hand. Bearing in mind that the external os of the cervix is at the tip of a thick fibro-muscular fold which projects from the cranio-dorsal vaginal wall, the tip of the catheter is carefully manipulated into the external cervical os. The catheter is next gently pushed along the cervical canal until the inflatable cuff engages the external os of the cervix. The cuff is then inflated and the inner catheter inserted into the outer catheter. The injection of dye is made over 2 minutes using gentle pressure. Only occasionally was it necessary to spend more than a few minutes introducing the tip of the catheter into the external os of the cervix. After completion of the injection the syringe plunger is released in order to allow any dye under pressure to run back into the syringe. Two radiographic exposures are made, one (a lateral exposure) with the animal on its side and the other (a dorsoventral exposure) with the animal prone. If the dye is being injected for the purpose of studying pathologic changes of the oviducts or ovaries, a little extra dye is used and the dye injected until resistance is encountered. It is contra-indicated to carry out tubal investigations in the presence of infection because of the danger of carrying infected material into the peritoneal cavity. While fluoroscopic studies have been made on tubal filling and the procedure found

* Winthrop Laboratories Limited, Windsor, Ontario.

* Nembutal: Abbott Laboratories Limited, Montreal, Quebec.

† Demerol: Winthrop Laboratories Limited, Toronto, Canada.

‡ Surital: Parke, Davis, and Company Limited, Brockville, Canada.

entirely practical, it is felt that the radiation hazard involved militates against this practice.

Results

The normal radiographic outline of the uterus and oviducts, especially the *post-partum* appearance, was carefully studied before entering upon a study of the abnormal.

Eighty dogs varying in weight from an 8 lb. Chihuahua to a 105 lb. Great Dane were injected and subsequently radiographed. On only two occasions was catheterisation unsuccessful; in both cases the animals were too obese to allow digital fixation of the cervix.

The female genital system is seen to increase gradually in size until the first "heat," at which time there is a rapid increase in size of both the genital and the suspensory tissue. The radiographic outline of the lumen of the uterus is doubled in length and breadth, and the horns and oviducts have a tendency to become coiled. The mid-cornual region of the uterus is found to lie in contact with the ventral abdominal wall, presumably as a result of the hypertrophy of the smooth muscle in the broad ligament. After metoestrus the radiographic outline of the uterus becomes much reduced, the metoestrus uterus being only half again the size of the anoestrus uterus (Fig. 2 to 8).

No studies were made on the pregnant uterus.

The post-parturient uterine outline is characterised by the corrugations associated with zonary placentations. When it is remembered that the foetal placenta takes with it an equivalent area of maternal placenta, post-parturient radiographs are more easily interpreted. Eight weeks after parturition there is still radiographic evidence of a previous pregnancy.

The passage of a catheter along the cervical canal can be made more easily at oestrus and for several weeks *post-partum*. The cervix is also relaxed to a varying degree in most pathologic conditions (a fact which makes uterine drainage and irrigation quite feasible), and metritis (acute, subacute and chronic), hyperplastic endometritis, cervicitis, uterus unicornis and myometrial cysts have all been diagnosed by hysterography.

Discussion

After the technique for the insertion of a catheter through the cervix had been mastered, hysterosalpingography was found to be an extremely useful diagnostic aid when pathologic changes of the canine genital system were suspected. It was found of greatest use in the diagnosis of pathologic changes of the uterus which involved little increase in size of genital tissues. Where the uterus was filled with fluid as much as possible was drained through the catheter after radiography. Of 11 cases in which the uteri were drained in this way before surgery, none succumbed. While these numbers are not statistically significant, it is felt that removal of fluid from the distended uteri was advantageous.

While hysterosalpingography is, as far as can be ascertained, a perfectly safe technique, it is felt that the filling of oviducts has not been a sufficiently

(*Concluded at foot of adjoining column*)

Nephrectomy in Goats

BY

M. A. PETRIS

Department of Agriculture Veterinary Service, Nicosia

SUMMARY.—Two cases of nephrectomy in goats are reported. The indications were pyelonephritis and echinococcus cyst respectively.

Nephrectomy is rarely practised on goats which have in the past been considered poor subjects for major surgery. It is hoped therefore, that the 2 cases following will be of interest.

Case 1

A THREE-YEAR-OLD Saanen she-goat was admitted to the Nicosia Veterinary Hospital with the history of loss of appetite, frequent urination, stiffness, loss of condition and persistent high temperature. The condition was recurrent despite treatment with antibiotics.

The animal was examined and found to be extremely sensitive over the left lumbar region. The least manipulation of the left kidney was greatly resented. Urine was collected and on examination albumin and abundant pus cells were detected. Because of the history of recurrent attacks and the value of the animal nephrectomy was decided upon.

The Radiographic Outline of the Genital System of the Bitch—*Concluded.*

constant finding to justify putting forward this technique in its present form as a means of diagnosing tubal obstruction; for it cannot be assumed that because it is not possible to obtain a salpingogram an oviduct is blocked, nor that the presence of dye in an oviduct means that the duct is physiologically normal. Of 50 injections made in normal animals only 6 times was dye observed to enter one oviduct and only on one occasion was spillage bilateral.

It is hoped that the technique described here for hysterography and hypsterosalpingography will help the researcher when making an assessment of the effect of drugs on the genital system of the bitch. It is also hoped that these techniques will help the clinician to obtain or confirm his diagnosis of many of the pathologic changes that affect the genital system of the bitch.

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Anaesthesia

Anaesthesia was induced by means of pethidine hydrochloride (5 mg. per kg. bodyweight) followed by the inhalation of a mixture of trichloroethylene* and oxygen. Induction of anaesthesia was quiet. A constant check on the breathing of the animal was kept and the percentage of trichloroethylene in the inhaled mixture was reduced gradually as the operation proceeded.

Restraint and Preparation

The goat was put on her right side. The fore and hind legs were secured separately to the operating table, and the left flank was shaved, cleansed and surrounded by sterile drapes.

Technique

A cutaneous incision commencing in the angle between the posterior border of the last rib and the transverse process of the first lumbar vertebra and extending 5 inches downwards and parallel to the border of the last rib was made. The muscles were also divided to the same extent. Haemorrhage was rather profuse and was controlled by ligating all bleeding points before proceeding further.

The index finger was introduced through the wound and by applying gentle pressure the exposed peritoneum was separated from the psoas muscles. Great care was taken to avoid puncturing the peritoneum. The left kidney was located and gently grasped between the first finger and thumb. It was then slowly drawn outside where, with the help of the assistant, it was kept in position. The renal fat was then slowly dissected off and the exposed organ was further drawn out. The urinary vessels were clasped with the bowel forceps and the exposed organ was surrounded with sterilised gauze. Double ligatures were applied on the exposed vessels and the kidney was then removed. An additional ligature around the two blood vessels and the ureter was then applied and the bowel forceps were removed; the remaining renal tissues were returned to their original position. The wound was dressed with intramammary penicillin and sulphanilamide and sealed in two stages.

First stage. A continuous suture with No. 1 20-day chromic catgut was used in the muscle layers.

Second stage. Skin. The skin was closed by a series of interrupted No. 6 nylon mattress sutures.

Sulphanilamide and intramammary penicillin were applied after the first stage. The skin was dressed with sulphanilamide and the wound covered with a fine layer of gauze. The goat recovered consciousness in 40 minutes. (An abscess the size of a hazel nut was found in the cortex of the kidney.)

Post-operative treatment

The post-operative treatment comprised :—

(a) Administration of 50 c.c. bovine serum for 2 days. The bovine serum was administered in order to expand the blood volume and avoid any post-operative shock.

(b) Camphor in oil daily for 4 days.

(c) 500,000 units procaine penicillin daily for 4 days.

(d) Warmth, and a diet of milk, gruel and barley water.

The animal was weak and unable to get up for 2 days. Pulse was weak the first day but became normal after the second administration of bovine serum. Respirations though shallow during the first day became normal afterwards.

Bowel movement and urination were normal on the third day and examination of urine on the 5th day showed neither pus cells nor albumin. The goat was discharged in 15 days. It is of interest to note that at the time of writing 7 months after the operation the animal is thriving, has given birth to 2 kids and has never shown any distress or inconvenience from having lost one kidney.

Case II

A 6-year-old Damascus she-goat with an echinococcus cyst in the left kidney.

History

The goat was admitted to hospital with the history of irregular appetite and frequent urination. Examination revealed nothing definite except an enlargement of the left kidney. It was therefore decided to perform an exploratory laparotomy.

Site

This time the incision was made further down the flank and the kidney was reached through the abdominal cavity. Having exposed the organ, the same procedure as in Case I was followed. This approach appears to be easier and no complication followed the opening of the abdominal cavity.

The incised peritoneum was sealed with a continuous suture using No. 0 20-day chromic catgut.

During the operation bovine serum mixed with 500 c.c. of glucose saline was continuously administered by the drip method.

The same post-operative treatment was followed except that intravenous oxytetracycline† (0.5 grammes) was given instead of penicillin.

The animal recovered much more quickly. It started to feed on the afternoon of the operation and was able to get up and move the same evening. There was no cessation of urination or bowel movements.

Acknowledgment.—I should like to express my thanks to Mr. R. W. Crowther, B.SC., M.R.C.V.S, for his help in preparing the report, and to the staff of the Nicosia Veterinary Hospital for the interest they showed and the care they took of these animals during their period in hospital.

*Trilene: Imperial Chemical (Pharmaceuticals) Ltd.

†Terramycin.

The Isolation of *Leptospira canicola* from the Kidney of a Pig

BY

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Department of Veterinary Pathology, University of Glasgow Veterinary School

SUMMARY.—The purpose of this paper is to record, for what is believed to be the first time in Great Britain, the recovery of a strain (No. 1078) of Leptospira canicola *from the renal tissue of a naturally infected pig. The main characteristics of the organism are described and details are given of the procedure which led to its isolation. Serological evidence of infection of other pigs is also offered and the relation of porcine leptospirosis to human infection by* L. canicola *is discussed.*

Introduction

IN this Department over 2,000 blood samples, collected at random from pigs slaughtered for human consumption in various abattoirs, chiefly in the counties of Stirling, Lanark, Renfrew, Ayr, Dumfries and Argyll, have been subjected to agglutination-lysis tests against 5 serotypes of *Leptospira* (*icterohaemorrhagiae*, *canicola*, *grippotyphosa*, *hyos* and *pomona*). Elsewhere has been published a preliminary report on the finding of antibodies to *L. icterohaemorrhagiae*, *L. canicola* and *L. pomona* (Michna, 1958). The survey also revealed a much higher incidence of *L. canicola* infection of pigs than was hitherto suspected. In March, 1957, 2 strains (Nos. 860 and 861) of *L. canicola* were recovered from the kidneys of 2 pigs, off the same farm, that were slaughtered at a bacon factory. The sera of those pigs were found to contain *L. canicola* antibodies in dilutions of 1 : 3,000 and 1 : 300 respectively.

Strain 1078 was obtained from a pig that had been reared on premises situated in the outskirts of Glasgow where, some weeks before, one of the attendants developed an illness that was diagnosed as *canicola* fever. At that time, in the Bacteriology Department of Glasgow Royal Infirmary, Dr. J. C. J. Ives found a high titre of antibodies to *L. canicola* in the serum of many in-contact pigs as well as in that of the worker. Of 3 dogs on the farm, 2 reacted serologically to both *L. canicola* and *L. icterohaemorrhagiae* but the third dog showed evidence of infection only by the latter organism. The 14 pigs implicated in this report came from the same piggery and samples of their blood and specimens of kidney were taken at the factory to which they had been sent for slaughter.

Materials and Methods

From each of 14 pigs, out of a batch of 25, sent to a bacon factory for slaughter, a sample of blood of about 25 ml. in amount was obtained during the course of bleeding-out and one kidney was procured as soon as the carcase had been eviscerated. The blood samples were stored overnight at room temperature ere the sera were recovered and tested with suspensions of *L. canicola*, *L. icterohaemorrhagiae*, *L. grippotyphosa*, *L. hyos* and *L. pomona* for the phenomena of agglutination-lysis by the technique of Schuffner, according to Wolff (1954). For purposes of preliminary screening, the sera were diluted to 1: 10, 1 : 30, 1 : 100 and 1 : 300 (after addition of an equal volume of antigen) in bell-mouth tubes, 5·5 cm. long by 1·0 cm. in diameter. The mixtures were then incubated at 32° C. for 4 hours. A reaction was deemed positive if complete lysis had occurred to a titre of 1 : 10 or 1 : 30 or if, in any of the other dilutions, at least 50 per cent. of the antigen had been lysed. As leptospiral antibodies were thereby found in all the samples of sera, the tests were subsequently repeated with higher dilutions of serum.

In all cases, within 5 hours of the decease of the animal, kidney material was seeded into Schuffner's medium (modified by Stuart, 1946), distributed in amounts of 3·5 ml. in screw-capped bottles of miniature, or bijou, size. From each kidney 4 cultures were made, including one from the contents of the pelvis. Renal tissue was extracted through the seared capsule by means of sterile Pasteur pipettes that were drawn from 6-in. lengths of soda-glass tubing, 7·0 mm. in outer diameter. Once the pipette had been plunged into the kidney, it was not withdrawn until, at least, 6 cores of tissue had been recovered, all of which were transferred to one bottle of medium. Cultures were then incubated aerobically at 32° C. and at fixed weekly intervals were examined by means of dark-ground illumination through a 16-mm. objective in combination with a 20x ocular. All the cultures were maintained for 5 weeks and, did they prove negative, only then were they discarded.

For biological examination, approximately, 2 grammes of material from diverse parts of each kidney were ground up in a mortar with sterilised silver sand and suspended in normal saline solution. So that the sandy particles might settle, the suspension was set aside for 5 minutes when it was centrifuged at 1,000 r.p.m. for 2 minutes, to deposit gross fragments of tissue without, it was hoped, simultaneous removal of too many leptospirae. To effect economy of experimental animals, the suspensions were pooled into 5 lots, 2 ml. of each of which were then inoculated intraperitoneally into Syrian golden hamsters (*Mesocricetus auratus*) of, approximately, 5 to 6 weeks of age. On the fifth day after inoculation, heart's blood and peritoneal fluid were recovered from each hamster and were sown, in quantities of 2 drops and 1 drop, respectively, into 2 groups of 4 miniature bottles of Schuffner's medium that were subsequently incubated and examined as already described for pig kidneys.

Where they were applicable, other procedures of examination included the staining of sections of tissue

by Mayer's (1903) haemalum and eosin and the silver impregnation techniques of Fontana and of Levaditi.

Results

Although the blood samples originated from pigs which were of the same killing and age groups and had been reared under similar environmental conditions, the serum titres, as shown in Table I, proved far from uniform.

TABLE I

TITRES OF ANTIBODIES IN PIG SERA TO *L. canicola* AND *L. icterohaemorrhagiae.*

Serum samples :	Antigens				
	L. canicola	*L. ictero.*	*L. gryppo-typh.*	*L. hyos*	*L. pomona*
1067	1 : 3,000	1 : 100	—	—	—
1068	1 : 1,000	1 : 30	—	—	—
1069	1 : 30,000	1 : 100	—	—	—
1070	1 : 100	1 : 10	—	—	—
1071	1 : 30	—	—	—	—
1072	1 : 100	1 : 10	—	—	—
1073	1 : 10,000	1 : 300	—	—	—
1074	1 : 300	1 : 10	—	—	—
1075	1 : 10,000	1 : 100	—	—	—
1076	1 : 3,000	1 : 10	—	—	—
1077	1 : 100	—	—	—	—
1078	1 : 1,000	1 : 30	—	—	—
1079	1 : 30	—	—	—	—
1080	1 : 1,000	1 : 30	—	—	—

Even at lowest dilution, not one sample reacted with either *L. grippotyphosa* or *L. hyos* or *L. pomona* whereas with *L. canicola* all the sera had titres that varied from 1 : 30 to 1 : 30,000. With 3 exceptions (samples Nos. 1071, 1077 and 1079) there was also some cross-reaction with *L. icterohaemorrhagiae.*

Direct evidence of infection by *L. canicola* was forthcoming when that organism was recovered from kidney No. 1078 and it is especially to be noted that growth in artificial culture was not observable until the fifth week of incubation. The reactions of this strain with 5 standard rabbit antisera, as well as with the serum from pig No. 1078, are recorded in the following table :—

TABLE II

AGGLUTINATION-LYSIS TEST OF *L. canicola* STRAIN 1078 WITH THE RABBIT LEPTOSPIRAL ANTISERA AND PIG 1078 SERUM

Antisera to :	Titre with Culture No. 1078
L. canicola	1 : 30,000
L. icterohaemorrhagiae ...	1 : 1,000
L. grippotyphosa	—
L. hyos	—
L. pomona	—
Pig serum No. 1078... ...	1 : 3,000

The interpretation of those results as indicative of infection by *L. canicola* was subsequently confirmed by Dr. J. C. Broom, of the Wellcome Laboratories of Tropical Medicine. It may here be added that isolation of leptospirae *via* hamsters was unsuccessful and that direct microscopical examination of films of macerated pig kidney failed to reveal the presence of the organism.

The virulence of Strain No. 1078 was tested by intraperitoneal inoculation of a guinea-pig of 530 grammes weight and of a hamster, 5 to 6 weeks old, with quantities of 2 ml. and 1 ml., respectively, of a third generation sub-culture. One hour after inoculation, from each animal a sample of blood was secured by cardiac puncture and sown into 3 bottles of Schuffner's medium which were incubated at 32° C. In cultures from the hamster, leptospirae were noted as early as the third day of incubation but in those from the guinea-pig organisms were not observable before the sixth day. Again from the guinea-pig, blood cultures were made on the third day after inoculation and yielded good growth of leptospirae that was distinguishable on the tenth day of incubation. The strain proved fatal to the hamster which was found dead on the morning of the sixth day after inoculation but cultures from the kidneys and the liver were found to be contaminated, mainly, by organisms of the coliform type. In the guinea-pig, apart from transient loss of appetite, the only clinical response was a thermal reaction which is illustrated in Fig. 1, whilst its serum was found to contain *L. canicola* antibodies only in a dilution of 1 : 30.

FIG. 1.

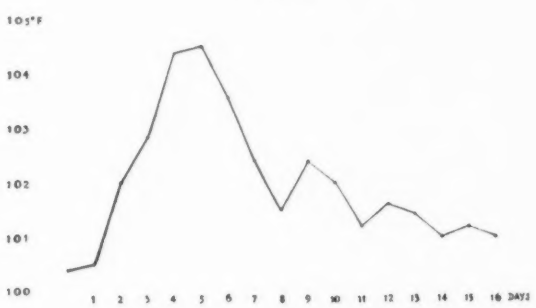

FIG. 1.—Temperature chart of guinea-pig inoculated with *L. canicola* strain 1078.

Discussion

Ever since Klarenbeek & Schuffner (1933) recorded the isolation of a new strain of *Leptospira* from a dog and called it *L. canicola*, the dog has been generally regarded as the sole animal host of this spirochaete (van Thiel, 1948). In consequence, human cases of *canicola* fever have been assumed to be of canine origin (Broom, 1948) just as swineherds' disease was deemed to have arisen from contact with pigs eliminating either *L. pomona* (Johnson, 1939 ; Gsell, 1944) or *L. hyos* (Gsell, 1948). Not a few cases of *canicola* fever, however, occurred without any history of contact with the dog and, in one instance, illness was a sequel of bathing in the River Thames (Baber & Stuart, 1946). The possibility of water-borne infection was further sustained when Williams *et al.* (1953) diagnosed *canicola* fever in 26 persons who had swum in water contaminated by the excreta of animals infected by *L. canicola.* Those animals included pigs

and cattle as well as dogs and the rate and severity of the human disease were significantly related to the frequency and the degree of immersion.

As a result of their inquiry into the incidence of *canicola* fever among owners of dogs infected by *L. canicola*, McIntyre and Seiler (1953) suggested the existence of sources of human infection other than dog urine. In Israel, van der Hoeden (1955) declared the jackal to vie with the dog as the chief reservoir of infection and later (1956) described infection in two herds of pigs that was associated with *canicola* fever in several attendant workers. The isolation of *L. canicola* by the same author (1957) from hedgehogs and from ticks which fed on a hedgehog has thrown a new light on this interesting problem. *R. norvegigus* was found to be a carrier of *L. canicola* by Varfolomeeva (1957). The reports of Seiler *et al.* (1956) and of Coghlan *et al.* (1957) bear witness to the presence of *L. canicola* in pigs in Edinburgh and district and emphasise the risk of transmission of that organism to workers in piggeries. Blagoveshchenskaya (1957) described an outbreak of leptospirosis in pigs and subsequent infection of 62 human beings who washed in water contaminated by pig excreta.

Cases of *canicola* fever in man are not always clinically recognisable, especially if they are of mild type and, as often, they culminate in aseptic meningitis. Their existence, however, may be retrospectively disclosed by serological means (Broom, 1951).

Of 2,012 samples of pig serum, which have been serologically examined in this laboratory, 89 (or 4·42 per cent.) were found to contain *L. canicola* antibodies in dilutions that ranged from 1 : 10 to 1 : 30,000. Most of the titres occurred at a dilution of 1 : 1,000 or over and the 89 samples were secured from seven different piggeries situated from 5 to over 30 miles apart. In addition to the 3 strains of leptospira cited in this article, 6 others have been recently recovered from pig kidneys.

Conclusions

The foregoing studies are held to support the view that, in Scotland, the incidence of *L. canicola* infection of pigs is considerably higher than has hitherto been realised and that pigs cannot be ignored as probable sources of infection of man. The infected pig is not only a daily risk to its attendants but, after slaughter, it may endanger also abattoir workers and butchers, thus constituting a problem of public health that has been already indicated by Ives (1957) and by Coghlan *et al.* (1957). Adequate information on the survival of *L. canicola* in raw pork is an urgent need ere the role of that food material in the transmission of disease to both man and dogs may be settled.

Acknowledgments.—My thanks are due to Professor J. W. Emslie for his advice and help in the preparation of this paper ; to Dr. J. C. Broom, of Wellcome Laboratories for carrying out the absorption tests on the isolated strains and for the confirmation of the diagnosis. Miss Doreen Cowan deserves the heartiest thanks for her excellent and devoted technical assistance.

(*Concluded at foot of adjoining column*)

THE LIVESTOCK EXPORT GROUP

Stock, numbering 314 head, exported through quarantine during the December quarter rose by 7.4 per cent. above the September quarter and equalled that for the last quarter of 1957. Cattle exports totalled 92, sheep 110, pigs 109, and goats 3.

The Group has been in correspondence with Australian Breed Societies seeking their views about the "blue tongue" ban. The United Pure-bred Dairy Cattle Breeders' Association and the United Stud-beef C.B.A. of Australia have approached the Australian authorities and recommended that the embargo be kept under constant review as Australian breeders are most conscious of the importance of introducing specially selected stock from overseas.

Representations by the Group have been made to F.A.O. emphasising the necessity to practise the greatest surveillance and control of blue tongue disease in Spain and Portugal to prevent its spreading from those areas. F.A.O. have replied that they are not yet directly engaged in any programme of eradication or research but intend to include it in their animal health work in the near future.

The Minister is considering a letter sent from the Group suggesting that the Ministry of Agriculture should send a representative to South Africa (and invite Australia to do likewise) where research into blue tongue has been going on for a number of years, to make a study of the disease, the result of which might lead to suitable precautions being taken against blue tongue and removing any likely risk of the disease entering Australia when importations are again resumed from Great Britain.

The Isolation of *Leptospira canicola* from the Kidney of a Pig—*Concluded.*

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Current Literature

ABSTRACTS

Indirect Transmission of Infectious Laryngotracheitis in Chickens. KINGSBURY, F. W., & JUNGHERR, E. L. (1958). *Avian Diseases.* **2.** 54-63.

The authors studied an outbreak of infectious laryngotracheitis affecting 15 flocks in and around a small town in Connecticut. In 5 cases the infection appeared to be introduced on clothing. In one it was attributed to crows and in another to a dog bringing in a carcase. The remaining 8 farms had a poor standard of hygiene and a heavy rat population. None of the outbreaks were attributed to direct spread from bird to bird.

E. A. G.

Steatitis in Cats Fed on Canned Red Tuna. MUNSON, T. O., HOLTZWORTH, J., SMALL, E., WITZEL, S., JONES, T. C., LUGINBUHL, H. (1958). *J.A.V.M.A.* **133.** 11. 563-8.

Steatitis, or the yellow discoloration of fat associated with the deposition of an acid-fast pigment was first described in laboratory animals fed on diets high in unsaturated fatty acids and low in vitamin E. A similar condition also occurs in mink, swine, and kittens when fed on rations high in fish scrap.

The authors describe 4 clinical cases in cats presented at the Angell Memorial Hospital, and make suggestions as to possible treatment.

The 4 cases occurred in cats from different environments, but a common factor in the diets was a commercial tinned cat food consisting almost entirely of red tuna fish.

The clinical symptoms presented were those of listlessness, reluctance, and difficulty in moving. There was extreme generalised tenderness, particularly over the back and abdomen. A subcutaneous lumpiness was found on palpation, particularly in the region of the ventral thorax and abdomen. The characteristic laboratory finding was an elevated leucocyte count with a neutrophilia and varying degrees of eosinophilia.

Prognosis appears to be good, provided the condition is recognised early enough and treatment instituted immediately. In addition the cat must be persuaded to eat a variety of foods other than red tuna. The recommended treatment consists of daily injections of vitamin E plus the addition of vitamin B complex. The authors also used penicillin-streptomycin, but suggest that in view of the increase in eosinophils, cortisone might perhaps hasten the clinical improvement by combating the intense inflammation associated with the foreign body reaction in the fat.

J. S. J. L.

Studies on the Nutritive Effects of Selenium for Chicks. NESHEIM, M. C., & SCOTT, M. L. (1958). *J. Nutr.* **65.** 601-17.

Two-day-old white Plymouth Rock chicks in groups of 17 to 20 were given experimental diet and water *ad libitum* until the end of the experiment. Selenium was shown to be a required nutrient for maximum growth. It also raised the blood serum albumen level in vitamin E deficient chicks.

0.1 p.p.m. selenium was effective in preventing exudative diathesis when chicks were given a purified diet based on soya bean protein or torula yeast diet. This was not interfered with by feeding 0.01 per cent. arsanilic acid. The torula yeast diet required a minimum selenium supplement of 0.08 p.p.m. to prevent diathesis and 0.1 p.p.m. for maximum growth in the absence of vitamin E. The latter figure is reduced to 0.04 p.p.m. in the presence of 100 I.U. vitamin E. The torula yeast diet contained 0.056 p.p.m. of selenium, therefore the total requirement to prevent exudative diathesis in absence of vitamin E is approximately 0.14 p.p.m., and to promote maximum growth in the presence of 100 I.U. vitamin E is approximately 0.1 p.p.m. selenium as sodium selenite.

Petroleum ether extracted residues of soya bean meal and standard middlings were relatively rich sources of a factor presumed to be a selenium compound which prevented exudative diathesis in chicks. Extracts from corn, wheat, oats, and corn gluten meal did not markedly reduce the incidence. The petroleum ether extracts, with the exception of corn, were all less effective than corresponding residue.

Subcutaneous injections of 0.6 mg. of selenium on alternate days led to complete recovery in chicks affected with exudative diathesis.

Selenium reduces the incidence of, but does not completely prevent, muscular dystrophy induced by a diet low in methionine and vitamin E deficient. The requirement to prevent muscular dystrophy is apparently greater than that to give maximum growth or prevent exudative diathesis.

A few chicks showed signs of encephalomalacia on diet supplemented by 0.1 p.p.m. selenium. This was not seen in chicks receiving vitamin E.

H. H.

The Effect of Antibiotics on the Infectious Sinusitis Agent of Turkeys. Part I: Egg Transmission. OSBORN, O. H., & POMEROY, B. S. (1958). *Avian Diseases.* **2.** 180-6.

The authors confirm that the pleuropneumonia-like organism (PPLO) that they regard as the causal agent of turkey sinusitis can be transmitted through the egg. Infected hen birds were treated for 5 months with various antibiotics. These were given either in the food at the very high level of 1,000 g. per ton of food, or as repeated intravenous or intramuscular injections. This intensive therapy did not prevent the transmission of PPLO to the hens' progeny, although their incidence was reduced. After the experiment it was found that the strains of PPLO carried by some of the hens were resistant to antibiotics.

E. A. G.

Travel Arrangements for the XVI th International Veterinary Congress*

Information has now been received through Messrs. Thomas Cook & Son of travel arrangements for this Congress, to be held in Madrid from May 21st to 27th. Details are as follows:—

By Air

Day flights operate daily from London Airport at 0915 hours or 1415 hours, arriving Madrid at 1230 hours or 1745 hours.

Cost of an air return ticket by these flights will be £53 6s. 6d. per passenger with an expected reduction of £2 13s. per person in the case of a party of not less than ten passengers, or £5 6s. if the party should number fifteen or more.

Night flights operate every Monday and Saturday, leaving London Airport at 0130 hours, arriving Madrid Airport at 0445 hours. Return from Madrid would be on Tuesdays and Sundays at 2115 hours, arriving London Airport on Wednesdays and Mondays at 0030 hours.

Cost of a return ticket, valid 23 days, and used in connexion with these night flights out and home, is expected to be £37 0s. 6d., with a reduction of £1 17s. per person in the event of a party of not less than ten passengers, or £3 13s. in the case of a party of fifteen or more passengers travelling together out and home.

All the air fares quoted are subject to Government approval and to the air company agreeing to concessions in connexion with air party traffic.

By Rail

If leaving London on a Monday, Wednesday, or Friday, departure will be at 1100 hours, arriving Madrid on Tuesdays, Thursdays, and Saturdays at 2100 hours, and for the return journey departure from Madrid would be on Mondays, Wednesdays, and Fridays at 0930 hours, arriving London at 2005 hours on Tuesdays, Thursdays, and Saturdays. In the case of departures on Sundays, Tuesdays, Thursdays, or Saturdays from London, then the special Talgo service will have to be used from Irun to Madrid and arrival at Madrid would be at 1815 hours Mondays, Wednesdays, Fridays, or Sundays, and departure from Madrid 1245 hours on Tuesdays, Thursdays, Saturdays, and Sundays.

Based on reductions expected to apply to members of the Congress, the cost of a first-class return ticket from London to Madrid will be £29 19s. 3d., that of a second-class return ticket £20 18s. 9d., and if travelling second class to the Spanish frontier and third class in Spain £19 8s. 7d. The following supplements will be applicable to the above-mentioned fares.

Ordinary Seats

Ordinary seats on trains out and home approximately £1 15s. per person.

Pullmans

Passengers wishing to reserve pullmans from the London/Dover portion of the journey will pay a supplement of 12s. over and above the above-mentioned seat reservations to cover the outward and homeward journeys.

Sleepers

Sleeping car accommodation from Paris to Irun could be provided at the following cost:—

	£	s.	d.
Single sleepers	6	14	0
Special sleepers	4	7	0
Berth in double compartment ...	3	3	6

This, in each case, is per person in each direction and applies to holders of first-class tickets only.

Couchettes

First- or second-class couchettes could be provided at an approximate cost of £1 7s. per person in each direction.

Passengers leaving London on Mondays, Wednesdays, or Fridays, and returning from Madrid on Mondays, Wednesdays, or Fridays, will pay a Rapid train supplement of 18s. first class, 15s. second class, or 9s. third class. Passengers leaving London on a Sunday, Tuesday, Thursday, or Saturday, and returning from Madrid on a Tuesday, Thursday, Saturday, or Sunday will pay a supplement which in the case of first-class ticket holders will be £6 9s. for the return journey, and in the case of second-class ticket holders £8 for the return.

In the event of a party of not less than ten passengers travelling by rail together out and home an approximate reduction of £2 10s. will be obtained on all classes of travel. It must be emphasised, however, that *passengers must travel out and home together.*

Excursions

Excursion No. 1, at an approximate cost of £42 10s. per passenger, is expected to run as follows:—

May 28th	Departure for Cordoba.
May 29th	Visit to Cordoba including the Mezquita and departure in the afternoon for Sevilla.
May 30th	Visit to Sevilla.
May 31st	Departure in the afternoon for Granada.
June 1st	Visit to Granada including the Alhambra leaving on June 2nd for Madrid.

This excursion would be suitable for those members of the Congress who are most interested in the Moorish architecture of Spain and wish to see what is, to the British mind, the most typically "Spanish" side of the country.

* Reprints of these arrangements are available from B.V.A. Headquarters.

*Excursion No. 2** is expected to operate as follows:—

May 29th Departure for Avila (visit) and on to Salamanca.
May 30th Visit to Salamanca and departure for Coimbra.
May 31st Visit to Coimbra and departure for Oporto.
June 1st Visit to Oporto and departure for Vigo.
June 2nd Departure for Santiago (visit) and on to Coruna.
June 3rd Free at La Coruna.
June 4th Departure for Lugo and Gijon.
June 5th After lunch departure for Santander.
June 6th Free at Santander.
June 7th Departure for Bilbao (visit) and on to San Sebastian.
June 8th End of arrangements, with breakfast at San Sebastian.

Those who book this excursion, or excursion No. 3, will have to make their own arrangements for return to London unless they first go back to Madrid. The advice of Thomas Cook & Son should be sought regarding the fares from San Sebastian or Barcelona.

The approximate cost per person for this excursion would be £63 and it should attract those members interested in Roman and Barroco architecture.

Excursion No. 3, at a cost of £42 per person, is expected to run as follows:—

May 28th Leave Madrid for Valencia by T.A.F. Service.
May 29th Visit to Valencia and departure in the evening for Palma.
May 30th Arrival at Palma and visit.
May 31st Excursion to Manacor.
June 1st Excursion to Valdemosa.
June 2nd Excursion to Formentor and departure in the evening for Barcelona.
June 3rd Arrive at Barcelona (visit).
June 4th Visit to Monastery of Monserrat.
June 5th End of arrangements, with breakfast at the hotel in Barcelona.

This excursion should prove of interest to those who wish to combine a holiday with the Congress, as they would be visiting one of the most popular holiday islands of Spain.

Dates of Booking

Those who wish to make their arrangements through Cooks must notify them not later than April 1st for party arrangements and not later than April 15th in the case of members travelling independently. Members are asked to state if they are prepared to travel on one of several alternative days or nights.

* Excursions Nos. 2 and 3 will be subject to sufficient bookings materialising to enable the necessary arrangements to be made.

ASSISTANT V.O. AT BIRMINGHAM

Readers will note a revised advertisement in our Classified section this week for an assistant veterinary officer in the veterinary and food inspection department of the Birmingham city authority. It is due to the efforts of Mr. C. G. Allen, the city's chief veterinary officer, that a better salary scale has been agreed for this post than was at first envisaged; hence the publication of the advertisement this week in an amended form.

AREA ERADICATION PLAN FOR TUBERCULOSIS: FREE TUBERCULIN TESTS

Further Tuberculosis Eradication Areas will be declared on March 1st, 1960, and farmers who have not yet applied for free tuberculin tests of their cattle should do so in good time, preferably before March 1st, 1959. Applications should be sent to the appropriate divisional veterinary officer.

The areas, which are the last to be so dealt with, are as follows:—

Cheshire, Derbyshire, Durham (part), Huntingdon, Isle of Ely, Lancashire (part), Leicestershire, Lincolnshire, Nottinghamshire, Northamptonshire (part), Northumberland, Rutland, Soke of Peterborough, Staffordshire, Warwickshire (part), Yorkshire (East Riding), Yorkshire (North Riding—part), Yorkshire (West Riding—part).

FIFTY YEARS AGO (*January 23rd,* 1909)

At least one veterinary surgeon, fifty years ago, was sceptical of new remedies. He wrote:—

The most cynical observer cannot honestly deny that our knowledge of therapeutics is advancing. This does not depend on the large number of new drugs that are constantly being introduced, it is to be attributed to more rational views on the treatment of diseases, a sounder knowledge of pathology, and a wise scepticism as to the real value of drugs in controlling the issues of life and death.

The firm belief in the virtues of drugs is fast approaching a moribund state in the minds of those who are not afraid to be regarded as unorthodox. Careful clinical observation has demonstrated that a tendency to recovery exists in all diseases that are recognised as curable. In the majority of instances where one line of treatment was regarded as *the* only safe and effectual means for recovery, and certain drugs as essential to the process, we now recognise that other lines of treatment, even *minus* the medicinal agents, give equally good results.

It is not uncommon to hear and to read of some wonderful results achieved by practitioners by the use of certain medicinal agents. If we were to question the correctness of their deductions and to suggest the ubiquitous power of the *vis medicatrix naturae*, our criticism would not be regarded in a friendly spirit: probably we should be described as veritable "cranks." Hence the imaginary virtues of the nearest antipyretics; also remedies for rheumatism, for broken wind and for distemper in dogs.

We hear the virtues of opiates lauded in the treatment of colic in the horse, and the hypodermic injection of morphine is believed to work marvels. Yet we know that the large majority of cases of colic not depending on an intestinal lesion, or on impaction, tend to recover spontaneously, and that a dose of oil of turpentine produces far better results than opiates of any kind in this affection.

A reaction is setting in with reference to antiseptics in surgical work. While the mind of the chemist is ever engaged in loading the market with new and expensive antiseptic agents the practitioner finds that there are no special virtues in these fancy articles, and he goes back to the time-honoured carbolic acid and the simple boric acid.

News and Comment

ELECTION OF MEMBERS OF THE R.C.V.S. COUNCIL

In accordance with the provisions of the Veterinary Surgeons Act, 1948, 6 members of the said Council, who must be members of the Royal College, will be elected in 1959 by members of the Royal College residing outside the Republic of Ireland.

Five present members of Council will retire at the Annual General Meeting in 1959 and are eligible for re-election, namely: Professor H. G. Lamont, J. B. White, Esq., Dr. W. R. Wooldridge, H. M. Wilson, Esq., and Professor T. J. Bosworth.

There is one further vacancy caused by the retirement of Mr. R. H. Smythe.

The term of office of the 5 persons elected in the place of the 5 members retiring by rotation will be 4 years. The term of office of the person elected in the place of Mr. R. H. Smythe will be one year.

Nominations of persons for election to the Council must be submitted in writing on a form which may be obtained from the Registrar, and which must be returned to him duly completed before January 31st, 1959.

Each such nomination form must bear the signature of the proposer and seconder, who must not be present members of Council, and must be counter-signed by the nominee.

THE SLAUGHTER OF ANIMALS ACT, 1958

This Act, which came into force on January 18th, consolidates the Slaughter of Animals Acts, 1933-54, and the Slaughter of Animals (Pigs) Act, 1954, and repeals the provisions of the Slaughterhouse Act, 1958, Section 8, etc., dealing with the slaughter of animals in slaughterhouses and knackers' yards.

The Slaughter of Animals (Prevention of Cruelty) Regulations, 1958, which were made under the legislation repealed are retained by Section 12 (2) of the new Act, as are slaughtermen's licences issued under the Slaughter of Animals Act, 1933.

Section 1 makes provisions for the slaughter of cattle, sheep, goats, swine, and horses (including asses and mules) with mechanically operated instruments in slaughterhouses and knackeries, and by such other methods as the Minister of Agriculture may prescribe by Regulations. Exceptions are provided for ritually slaughtered animals. Section 2 incorporates the provisions of the Slaughter of Animals (Pigs) Act, 1954, making it obligatory to use —elsewhere than in a slaughterhouse—a mechanically operated instrument for the slaughter of pigs over the age of 12 weeks except in a laboratory or place of research, for diagnosis or research, in connexion with veterinary surgery or medicine. Section 3 makes provisions for the annual licensing of slaughtermen and for the revocation and suspending of licences, and provides for appeals in respect of licences refused, revoked, or suspended. It is illegal for unlicensed persons to slaughter animals on licensed premises except those employed by the Minister and acting under the Diseases of Animals Act, 1950.

Section 4 gives the Minister power to make Regulations for the welfare of animals in slaughterhouses and knackeries. Section 6 empowers local authorities providing slaughterhouses to employ slaughtermen to stun or slaughter animals. Penalties for contravention are fines not exceeding £50 or imprisonment up to 3 months, or both fine and imprisonment (Section 5). Obstruction of an authorised officer may be punished by a fine not exceeding £5 (Section 8 (2)). The Act does not authorise entry into premises within an infected place under the Diseases of Animals Act (Section 8 (3)).

THE ROYAL COLLEGE OF VETERINARY SURGEONS

The under-mentioned were admitted to membership of the Royal College on the dates indicated:—

Baber, John Brian, 96, Belleville Road, London, S.W.11, January 8th, 1959, B.VET.MED. (LOND.); Ball, David Clifford, The Vicarage, Affpuddle, Dorchester, Dorset, January 8th, 1959, B.VET.MED. (LOND.); Beach, Leonard Simmonds, "Freden," Lunsford Lane, Larkfield, Maidstone, Kent, January 8th, 1959, B.VET.MED. (LOND.); Bewsher, Colin Berkeley, "Glenmane," Callander, Perthshire, December 19th, 1958, B.V.M.S. (EDIN.); Bradley, Jean (Miss), Primrose Side Cottage, New Brancepeth, Co. Durham, December 19th, 1958, B.V.M.S. (EDIN.); Bradley, Raymond, 8A, Valleyfield Road, Streatham, London, S.W.16, January 8th, 1959, B.VET.MED. (LOND.); Cameron, Ian Duncan, 16, Mulberry Road, Glasgow, S.3, January 10th, 1959, B.V.M.S. (GLAS.); Castell, Michael John Hartley, "Trebartha," Alverton, Penzance, Cornwall, January 8th, 1959, B.VET.MED. (LOND.); Chapman, Richard Hereward, Hales Place, High Halden, Kent, January 19th, 1959, B.V.SC. (BRIS.); Creek, Michael John, 31, Broadmeadow Road, Wyke Regis, Weymouth, Dorset, January 8th, 1959, B.VET.MED. (LOND.); Crittall, John Lawrence White, 2, 19th Avenue, Famona, Bulawayo, S. Rhodesia, January 19th, 1959, B.V.SC. (BRIS.); Daniels, Michael George, 2, Leeson Road, Bournemouth, Hants., January 8th, 1958, B.VET.MED. (LOND.); Davies, Edryd Morgan, 37, Coldstream Street, Llanelly, Carms., January 8th, 1959, B.VET.MED. (LOND.); Davies, Thomas Hicks Roberts, Pistyllmeigan, Boncarth, Pembs., January 19th, 1959, B.V.SC. (BRIS.); Farrow, Anthony Bernard, 18, Byron Road, Chelmsford, Essex, January 8th, 1958, B.VET.MED. (LOND.); Fox, Gerald William, "Lea Haven," Cockhill Field Lane, Braithwell, Nr. Rotherham, Yorks., January 8th, 1959, B.VET.MED. (LOND.); Hagan, Dennis Hamill, 31, Orleans Avenue, Glasgow, W.4, January 10th, 1959, B.V.M.S. (GLAS.); Jones, Brian, Rosendale Golf Club, Helmsmore, Rosendale, Lancs., January 8th, 1959, B.VET.MED. (LOND.); Jowett, George David, 20, Westminster Avenue, Morecambe, Lancs., January 19th, 1959, B.V.SC. (BRIS.), B.SC. (ZOOL.) (SHEFFIELD); Kamara, John Abu, The Veterinary Dept., Tekko, Sierra Leone, W. Africa, January 8th, 1959, B.VET.MED (LOND.); Kirby, Brian, 186, Gravelly Lane, Erdington, Birmingham, 23, January 8th, 1959, B.VET.MED. (LOND.); Lacey, David George, Fallowfield, Cobham Way, E. Horsley, Surrey, January 8th, 1959, B.VET.MED. (LOND.); Lang, David Christopher, Threeways, Limpsfield, Oxted, Surrey, January 8th, 1959, B.VET.MED. (LOND.); Lopatkin, Ivan, 135, Old Montague Street, London, E.1, January 10th, 1959, B.V.M.S. (BRIS); Marriott, David William, 240, Heath Road, Ipswich, Suffolk, January 8th, 1959, B.VET.MED. (LOND.); Montgomery, John Forbes, 2, Cumin Place, Edinburgh, 9, December 19th, 1958, B.V.M.S. (EDIN.); Moody, Peter Warner, The Old Parsonage, West Harnham, Salisbury, Wilts, December 19th, 1958, B.V.M.S. (EDIN.); Morley, Arthur Frederick, 35, Crescent Lane, Clapham Park,

London, S.W.4, January 8th, 1959, B.VET.MED. (LOND.); Oliver, John Julian, 222, Chase Side, Southgate, London, N.14, January 8th, 1959, B.VET.MED. (LOND.); O'Shea, Jeremy David, 36, Winchester Road, Andover, Hants, January 8th, 1959, B.VET.MED. (LOND.); Oxenham, Michael, "Chy-an-Bray," Trebetherick, Wadebridge, Cornwall, January 8th, 1959, B.VET.MED. (LOND.); Picking, Patricia Joan (Mrs.), 13, Elmscroft Gardens, Potters Bar, Middx., January 8th, 1959, B.VET.MED. (LOND.); Pottie, Alexander Donaldson, 27, Thornley Park Avenue, Paisley, Renfrewshire, January 10th, 1959, B.V.M.S. (GLAS.); Porter, George, Jolly Sailor Hotel, Radcliffe Road, Fleetwood, Lancs., January 8th, 1959, B.VET.MED. (LOND.); Prior, Michael Geoffrey, 181, Derby Road, Long Eaton, Nottingham, January 19th, 1959, B.V.SC. (BRIS.); Prosser, Graham George, 25, High Street, Honiton, Devon, January 8th, 1959, B.VET.MED. (LOND.); Roberts, Edward Elfyn, Ye Olde Mill Stores, Llanfairfechan, Caerns., January 8th, 1959, B.VET.MED. (LOND.); Robinson, John Clowes, 655, Lightwood Road, Longton, Stoke-on-Trent, Staffs., January 8th, 1959, B.VET.MED. (LOND.); Sayle, Bryan, 72, Longmead Avenue, Hazel Grove, Cheshire, January 8th, 1959, B.VET.MED. (LOND.); Seed, James Henry, 10, Woodlands Avenue, Ribbleton, Preston, Lancs., January 8th, 1959, B.VET.MED. (LOND.); Sinclair, Ian Willard, 86, Hadley Highstone, Barnet, Herts., January 8th, 1959, B.VET.MED. (LOND.); Smith, George Alfred, 39, Berkeley Road, Peterborough, Northants., January 8th, 1959, B.VET.MED. (LOND.); Smith, Ian Geoffrey Newlands, Muringa, P.O. Box 24, Moiben, Kenya Colony, December 19th, 1958, B.V.M.S. (EDIN.); Smith, Roderick John, Hampton Villa, Wool, Wareham, Dorset, January 8th, 1959, B.VET.MED. (LOND.); Swan, Bernard Anthony Kavanagh, The Queen's Hotel, Stockton-on-Tees, Co. Durham, January 19th, 1959, B.V.SC. (BRIS.); Thrift, Ronald James, 60, Isham Road, Norbury, London, S.W.16, January 8th, 1959, B.VET.MED. (LOND.); Toes, Michael Matthew, 1, Windsor Road, Whitestake, Nr. Preston, Lancs., January 8th, 1959, B.VET.MED. (LOND.); Tribe, George William, Red Cat Hotel, North Wooton, King's Lynn, Norfolk, December 19th, 1958, B.V.M.S. (EDIN.); Trim, Peter Noel, Woodcote, Martelle Road, Branksome Park, Bournemouth West, Hants., January 8th, 1959, B.VET.MED. (LOND.); Turnbull, Patrick Alwyn, 12, Exeter Street, Launceston, N. Cornwall, January 8th, 1959, B.VET.MED. (LOND.); Van Laun, Thomas, The Old Forge, Dallington Green, Northampton, January 8th, 1959, B.VET.MED. (LOND.); Wade, David William Howard, c/o "Rhos," Trinity Road, Aberystwyth, Cards., January 8th, 1959, B.VET.MED. (LOND.), B.SC. (AGRIC.) (ABERYSTWYTH); Watts, Michael Edwin Thomas, The Hermitage, Hermitage Street, Crewkerne, Som., January 19th, 1959, B.V.SC. (BRIS.); Westaway, Arthur John, "Minstead," 8, Keydell Avenue, Horndean, Hants, January 19th, 1959, B.V.SC. (BRIS.); Wilkinson, Edwin, Moorside Farm, Ilkley Road, Riddlesden, Keighley, Yorks., January 8th, 1959, B.VET.MED. (LOND.); Winstanley, Eric William, 199, Green Lane, Bolton, Lancs., January 8th, 1959, B.VET.MED. (LOND.); Wright, Jeremy Neil, "Dunsmeade," Worcester Lane, Pedmore, Stourbridge, Worcs., January 8th, 1959, B.VET.MED. (LOND.); Wrigley, Arthur, Fircroft, Copt Hall Road, Ightham, Nr. Sevenoaks, Kent, January 8th, 1959, B.VET.MED. (LOND.); and Yarrow, Thomas Goodwin, 110, Corve Street, Ludlow, Shropshire, January 19th, 1959, B.V.SC. (BRIS.).

CLASSIFIED ADVERTISEMENTS

It has been noticed that in spite of the publication of charges for these advertisements, an increasing number of our readers are either telephoning them or sending them without payment. While we are anxious to be of as much service as possible, this practice leads to a great deal of additional clerical work and it would help us very much if advertisers would be good enough to write their advertisements (not telephone them) and to see that they are prepaid.

The Classified Advertisements section is an uneconomic service and we feel sure our readers will understand that we should like to avoid adding to the cost of it by unnecessary clerical work.

UNIVERSITY NEWS

Liverpool

EXAMINATION LIST

Degree of B.V.Sc.

THIRD EXAMINATION, PART I (PHARMACOLOGY)

Batty, A. F.; Davies, J. O.; Evans, W. E. S.; Fell, C.; Fitton, M. W.; Jones, R. M.; Peel, D. R.; Procter, G.; Proudlove, A. J.; Thomas, J. K.; and Zagni, P. A.

MR. JOHN HENRY WYNNE

Mr. R. S. Smyth writes:—

The passing of John Henry Wynne, F.R.C.V.S., on December 20th last at the ripe age of 90 calls forth the feelings one may have at the felling of a stately oak. As possibly the last of his assistants in his practice in Denbighshire in 1926, I am urged to reflect upon his sterling qualities.

I often heard him relate how he was brought up on an upland farm in Merionethshire and had worked there with his father until, in his late twenties, he went to the veterinary school in Liverpool. To do this he had to work part-time in an ironmongery and to learn English. He qualified at the age of 30 and set up practice in Denbigh. Having secured premises and equipment he was left, as he has told me, with only one penny. His initiative, industry, professional integrity, and business acumen can be judged by the fact that at 56 years of age he was reported to be a wealthy man and retired to pursue other interests.

I remember having to call him out of his bed long after midnight on two snowy nights to help me with difficult calving cases. He did so with willingness and without one word of criticism or rebuke; he gave me only encouragement and advice. His diagnosis was always founded on a most thorough examination, and his treatment was completely up to date. His clients, rich and poor alike (they were mostly poor in those days), placed absolute confidence in him.

Mr. Wynne always read his VETERINARY RECORD carefully every Sunday, and kept abreast of the times throughout his long life. I feel certain that our profession was held in high esteem by those who knew him, and that his example may well be followed by all who enter it.

INTERNATIONAL VETERINARY CONGRESS PHOTOGRAPHIC EXHIBITION AND FILMS

We are asked to remind those who intend to send photographs that, owing to limitations of space, the size of pictures should be 24 by 18 *centimetres*. Two prints of each exhibit should be forwarded, each print bearing a typewritten caption. Address: Secretaria general del XVI Congresso Mundial de Veterinaria, Villanueva 11, Madrid.

Films for exhibition at the Congress should be sent to the same address to arrive not later than April 22nd. No individual film should exceed a showing time of 30 minutes.

PERSONAL

Captain J. Fox, veterinary officer at Birkenhead Port, retired on January 17th.

Dr. S. E. Piercy has been invited to attend a conference on The Biology of the Pleuropneumonia-like Organisms, which has been organised by the New York Academy of Sciences, and to read a paper. While in the United States he expects to visit a number of research institutes to study the work going on in the field of veterinary virology.

Mr. J. Scarnell, deputy head of the Wellcome veterinary research station at Frant, has been appointed lecturer in clinical pathology in the faculty of rural science at the New England University of Armidale, New South Wales.

Dr. Norman Wright, chief scientific adviser (food) to the Minister of Agriculture, has been appointed Deputy Director-General of the Food and Agriculture Organisation of United Nations.

Dr. Wright was director of the Hannah Institute from 1928 to 1947 and a member of the Agricultural Research Council from 1950 to 1955.

Marriage

JUKES—REID.—At St. James' Church, New Malden, on January 17th, 1959, Michael Gordon Martin Jukes, B.A., B.SC. (OXON), elder son of Mr. E. Martin Jukes, Q.C., and Mrs. Jukes of 25, The Green, Kew, to Marjory Matheson Russell Reid, M.B., B.CHIR. (CANTAB.), daughter of Mr. John Reid, M.R.C.V.S., and Mrs. Reid, 43, Blakes Avenue, New Malden, Surrey.

Births

BARKER.—On January 8th, 1959, to Ann, wife of David Julius Barker, B.V.SC., M.R.C.V.S., of Magnolia House, Long Street, Williton, Somerset, a daughter, Sally.

BLAIR.—On January 1st, 1959, to Ruth (B.V.SC., M.R.C.V.S.), wife of Dr. Robert Blair of Rosedale, Woodcote Road, Altrincham, Cheshire, a daughter, Catherine Jane.

FELGATE.—On January 13th, 1959, at King's Lynn, to Annette (*née* Adams), wife of C. A. G. Felgate, M.R.C.V.S., a son, Timothy, brother for Wendy and Diana.

JAMES.—To Joy, wife of R. A. James, M.R.C.V.S., on December 4th, 1958, at Tiverton, a son, Marcus Richard, brother for Amanda and Christopher.

LEMON.—On January 13th, 1959, at the Ipswich and East Suffolk Hospital (Heath Road Wing), to Vivien (*née* Kipling), wife of Donald Lemon, M.R.C.V.S., of Hadleigh, Suffolk, a son, a brother for Susan.

WILLIAMS.—On January 8th, 1959, to Marina (*née* Griffiths), wife of Gwynne Llewellyn Williams, M.R.C.V.S., of New Street House, Upton-on-Severn, Worcs., a son.

COMING EVENTS

January

28th (Wed.). Winter Meeting of the North of Scotland Division in the Marcliffe Hotel, Aberdeen, 2.30 p.m.

General Meeting of the Sussex Veterinary Society in the Old Ship Hotel, Brighton, 2.30 p.m.

General Meeting of the Southern Counties Veterinary Society in the Grand Hotel, Bournemouth, 7.45 p.m.

30th (Fri.). Annual Ball of the Royal (Dick) School of Veterinary Studies in the Assembly Rooms, George Street, Edinburgh, 9 p.m.

Annual General Meeting of the Yorkshire Veterinary Society in the Hotel Metropole, Leeds, 1, 2.30 p.m.

Annual General Meeting of the North of Ireland Veterinary Association in the Faculty of Agriculture, Elmwood Avenue, Belfast, 7 p.m.

February

4th (Wed.). Meeting of the West of Scotland Division at the Veterinary Hospital, Bearsden Road, Bearsden, Glasgow, 2.30 p.m.

6th (Fri.). Meeting of the Shropshire Veterinary Club at the Oak Hotel, Shelton, Shrewsbury, 8 p.m.

11th (Wed.). Annual General Meeting of the Society for the Study of Animal Breeding at the Royal Society of Medicine, 1, Wimpole Street, W.1.

7th Annual General Meeting of the Society for the Study of Animal Breeding, in the West Hall, R.S.M., 1, Wimpole Street, London, W.1, 11.30 a.m.

13th (Fri.). General Meeting of the Midland Counties Veterinary Association at the Angel Hotel, Ludlow, Salop., 2.30 p.m.

19th (Thurs.). Meeting of the B.S.A.V.A. Midland Area at the Chace Hotel, Coventry, 7.30 p.m.

26th (Thurs.). Annual Ball of Glasgow University Veterinary Association at the Cadoro Restaurant.

March

10th (Tues.). Annual General Meeting of the Eastern Counties Veterinary Society at the Bell Hotel, Norwich.

20th, 21st and 22nd (Fri., Sat. and Sun.). Conference of the British Small Animal Veterinary Association in London.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Northants. North Farm, Ringstead, Kettering (Jan. 13).
Westmorland. Michael Yeat Farm, Lyth, Crosthwaite, Kendal (Jan. 14).

Fowl Pest

Essex. O.K. Piggeries, Great Hallingbury, Bishop's Stortford; Friendship Farm, Bicknacre, Chelmsford; Brookside Dairy Farm, Southend Road, Gt. Baddow, Chelmsford; Salesfrith Farm, East Hanningfield, Chelmsford (Jan. 15); 26, Crow Lane, Romford (Jan. 17); Galleywood Hall, Great Baddow, Chelmsford (Jan. 17); Courtlands, Cranfield Park Road, Wickford; Canterbury Lodge, Margaretting, Ingatestone (Jan. 18).
Kent. Red House Farm, New Inn Green, Lympne (Jan. 17).
Gloucs. 49, Innsworth Lane, Gloucester (Jan. 13).

Lincs. Oakleigh, Anwick, Sleaford (Jan. 13); The Hardings, Anwick Fen, Sleaford (Jan. 14); Jubilee Cottage, Anwick, Sleaford (Jan. 15).
Norfolk. The Bungalow, Church Lane, Wicklewood, Wymondham (Jan. 16); Lictak, Bridge Street, Brockdish, Diss (Jan. 18).
Suffolk. Crown Farm, Westhorpe, Stowmarket (Jan. 16); Hoxne Gardens, Hoxne (Jan. 19).

Swine Fever

Berks. Camp Road Allotments, South Ascot (Jan. 14).
Derbys. Fields Farm (W. Needham), Upper Newbold, Chesterfield (Jan. 13); Rutland Works, Bakewell (Jan. 14).
Devon. Main Piggery, Loosbeare Farm, Zeal Monachorum, Crediton (Jan. 15).
Essex. Ryes Farm, Little Henny, Great Henny (Jan. 13); 2, Ponders Cottages, Fordham, Colchester (Jan. 14).
Lancs. Windy Ash, Cutts Lane, Out Rawcliffe, Preston (Jan. 13); 7, Ecclesgate, Marton Moss, Blackpool (Jan. 14).
Leics. Shawall Manor, Shawall (Jan. 19).
Norfolk. Outlying Premises at Cromer Road, Upper Sheringham (Jan. 15); Old Cottage Farm, East Ruston, Norwich (Jan. 19).
Suffolk. Brook Hall, Foxearth, Sudbury (Jan. 19).
Notts. Edmonthorpe Lodge, Colston Bassett (Jan. 13).
Warwicks. 1,246, Yardley Wood Road, Shirley, Solihull (Jan. 14); Brackenlands Farm, Stonebridge Road, Colesh.ll, Birmingham (Jan. 15); Yew Tree Farm, Tidbury Green, Solihull, Birmingham (Jan. 16).
Wilts. 1, Moggs Lane, Calstone, Calne (Jan. 14); Mill Farm, Cherhill, Calne (Jan. 16).

ADVERTISER'S ANNOUNCEMENT

GLAXO LABORATORIES LTD. announce a new pack of Streptopen Cerate which is now available on the home market. This pack will be a box of 100 tubes.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

Pentobarbitone Intraperitoneally

Sir,—"Haphazard" and "lackadaisical" are not the terms one expects Mr. J. S. Heath to use in a professional journal about the administration of pentobarbitone sodium by the intraperitoneal route, which is a recognised method and, I believe, one of the first to be used in the administration of this drug. That it has disadvantages I am well aware, but I have found it of great assistance in anaesthesia of cats under the conditions that prevail here.

With a little patience surgical anaesthesia is induced in a few minutes, and I can carry on without undue anxiety. Using a good technique the intraperitoneal administration of pentobarbitone presents no problem and there is virtually no risk of infection or damage to abdominal organs. It certainly cannot be described as a slovenly method in those creatures in which the veins are too small to allow for injection intravenously. I would also recommend this method to Mr. Heath as a very satisfactory way of anaesthetising monkeys of the smaller species. As to the intrathoracic route I never tried it and can make no comment.

The open mind is surely one of the great attributes of the scientist, and it therefore hurts me to read Mr. Heath's exhortation to students to disregard methods which, under certain circumstances, might serve them very well.

Yours faithfully,
W. D. C. PARKES.

Veterinary Department,
P.O. Box 57,
Mbeya,
Southern Highlands,
Tanganyika,
East Africa.
January 9th, 1959.

Prolapsed Vagina of the Ewe

Sir,—Recent letters to you regarding experiences in the field with the condition of prolapsed vagina in the ewe I find most interesting, as I have recently returned from New Zealand where this condition is prevalent. A great deal of work has been done, and is still being carried out, at Ruakura Animal Research Station in the North Island and Lincoln Agricultural College in the South Island. At the Ruakura Hill Country Station a flock of about 100 ewes, all daughters of "bearing ewes," are being run together under controlled conditions of management, prinicipally to examine the question of hereditary defects.

In my experience this condition occurred from about a month before, to a month after, lambing, under all types of weather, feed and geographical conditions, and in all ages of ewe. From time to time one may have thought there was some definite pattern of incidence only to have the picture suddenly change with, perhaps, a sudden variation in weather, which would in turn affect feed, feeding habits and duration of pregnancy. In my area where the farmers had been trying to cope with the situation without veterinary assistance for years, it was almost impossible to build up a definite picture, so varied were their experiences.

We tried all types of mechanical devices from the balloon to the stainless steel wire retainer. In about 50 per cent. of cases these worked well, with or without starvation as an adjunct, and little time was lost in dealing with them.

The persistent cases were the problem and these quickly dispensed with any mechanical device, almost before it was in position, and no amount of stitching would hold the bearing in. The majority of these cases occurred about 10 days before lambing was due, and generally good results were obtained after an intramuscular injection of penicillin and stilboestrol. Those that did not abort within 24 hours had usually stopped straining and would accept a retainer; two-tooth ewes reacted quicker than full-mouth ewes as would be expected. A great many of the lambs aborted had been killed by the extreme pressures exerted and were frequently "waterlogged."

The remaining cases of *pre-partum* prolapse I attended to surgically, methods varying with age, extent of secondary infection, etc. A case of complete prolapse of the lamb-bed was rare.

Perhaps the most difficult aspect of this condition is the *post-partum* prolapse of the vagina and os cervix. This usually occurred about a month after lambing, and frequently went undetected for some time due to the small size of the os cervix. Fly strike is a revolting feature at this time. The discomfort of the ewes varied from extreme continual straining to exhaustion of the pelvic musculature. No amount of manipulation would retain the bearing, and although it could be contained with sutures, the ewe eventually finished up with a flaccid torpedo-shaped rump containing the prolapse. Treatment with intramuscular injections of pituitrin I found to be useless, but I did find testosterone useful in reducing straining.

Due to the habit of culling bearing ewes there is an impression of age incidence. I made it a habit of ear-marking the ewes I treated, and I did not find this so, nor did I find any significant recurrence at the next season.

A frequent cause of death of the prolapsed ewe is due to rupture of the bladder. On manipulation the bladder should be emptied first, and if found to be in a dangerously tense state, drained with a hypodermic needle. Antiseptic solutions that are to any degree irritant should be avoided and secondary infection of the dry and fissured mucous membrane treated with antibiotic injections.

This complex condition is undoubtedly of importance in many sheep-breeding areas, and much time is spent by the harassed farmer in nursing these distressed ewes. In New Zealand a farmer frequently tends 1,500 ewes on his own in mixed country, and finds it impossible to give much time to these passengers. It was not unusual for me to be presented with up to 30 bearing ewes on one property, whilst next door under virtually the same conditions, the problem was absent, for that season.

It would appear that flock management, weather, breed, twinning, terrain and type of feed all play their part in producing this perplexing condition.

Yours faithfully,
A. R. WATSON.

Glaxo Laboratories Ltd.,
Greenford, Middlesex.
January 19th, 1959.

Listerellosis (?) in Calves

Sir,—On three occasions recently I have encountered young calves—mostly under 3 months of age, but some older—exhibiting symptoms of central nervous disease. So far I have been unable to trace a cause, and I wonder whether others among your readers have come across similar cases?

The first were of 3 calves housed together in dirty, unsanitary surroundings, though in good condition. They were sucking a nurse cow with ample milk for their needs. The first to be affected was a Friesian calf 2 months old, reasonably well grown, and in fair bodily order. The symptom first observed was that one ear was carried lower than the other. Within 3 days this became very marked, the head was held on one side, the eyelid on the affected side drooped a little, and there was difficulty in sucking and swallowing.

The following day another, younger calf in the same pen, was drooping the opposite ear, and on the next day the last calf also was affected. None of the calves was ill; all would suck, and when let out in the yard would gallop about with their tails up as if they were quite well.

The V.I.O. was consulted by telephone and suggested possible listerellosis. Antibiotics and sulpha drugs combined were used but there was no response to treatment. The owner, therefore, decided to send the group for slaughter and agreed to save the head of the worst affected for *post-mortem* examination. This was done and the head was sent to the V.I.O. His examination showed "some thickening of the meninges but no evidence of perivascular cuffing as seen in listerellosis or meningitis." Bacteriological examination proved negative but perhaps heavy antibiotic treatment could account for this.

I have since encountered similar cases on two other widely separated farms, and would be interested to know if other veterinary surgeons are meeting similar cases and if they have been more successful in diagnosis than I.

Yours faithfully,
K. G. MORGAN.

Llanover Lodge,
Welsh Street,
Chepstow,
Mon.
January 14th, 1959.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th Dec., 1958		13	—	—	38	—	78
Corresponding period in	1957	8	—	30	62	—	36
	1956	12	—	9	113	—	18
	1955	26	1	—	145	—	41
1st Jan. to 15th Dec., 1958		156	5	116	705	—	1,224
Corresponding period in	1957	307	8	165	959	—	921
	1956	1,230	11	155	884	—	718
	1955	747	7	7	769	—	1,372